Long-term population dynamics in southwest Iran

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1 Introduction

The natural environment of southwest Iran, consisting of lowland alluvial plains backed by the foothills and mountain ranges of the Zagros front, creates multiple landscapes often cast in opposition to one other that are crucial to understanding the socio-cultural, political and economic development of the region. Like its Mesopotamian neighbour, this region has long been studied with a focus on major transformations such as early agriculture, state formation, urbanization, early empires and major socio-technical advancements such as massive irrigation systems. After intensive research within southwest Iran during the 1960s and 70s, and several decades of comparatively sparse archaeological investigations, there has recently been renewed fieldwork in the region by foreign teams, accompanying the uninterrupted work by Iranian archaeologists (Abdi 1999, 2002, 2003; Alden et al. 2005; Alden et al. 2004; Alizadeh 2003b; Alizadeh et al. 2004; Miller & Sumner 2004; Moghaddam & Miri 2003). Fortunately, over the last few decades much of the early research was published and provided information for analysis and reanalysis.

The focus in this study will be on how settlement data obtained from archaeological survey is used to define population trends at a regional and interregional level. Within southwest Iran, archaeological survey is well developed thanks to the pioneering work of Robert McC Adams (1962) over forty years ago, and a fluorescence of surveys in the two decades following that (Hole 1969b; Johnson 1973; Levine & McDonald 1977; Miroschedji 1981; Neely & Wright 1994; Schacht 1976; Sumner 1972; Wright 1969, 1979; Wright & Carter 2003; Zagarell 1982). Methodological and theoretical approaches to survey employed to draw out the settlement patterns of the region have taken many forms, and will be reviewed in detail in a later chapter. Briefly, many of the projects conducted in the 1960s and 70s in southwest Iran were heavily influenced by a more processual framework with a focus on systems, and functional and ecological models. Many surveys were undertaken with problem oriented frameworks, keen on answering the big questions surrounding early agriculture, early state formation and urbanization, or with period-specific focus (i.e. Hole 1977; Hole et al. 1969; Johnson 1973). Equally, a long-term view of settlement trends has been utilized by several projects (Adams 1962; Sumner 1972) and integrated into studies of long-term regional population dynamics (Sumner 1990a). Studies of population trends utilizing settlement data tended to focus on the role of population change in these major transformations (Smith & Young 1972, 1983; Weiss 1977).

Other general studies of the region have placed importance on textual evidence, an important source (Carter & Stolper 1984; Potts 1999), but one that confines discussion to proto-historic and historic times, and glosses over the role of mobile populations in the archaeological record. Study and restudy of ceramic assemblages have also been key in making inferences about population trends (Alizadeh 1992; Kouchoukos 1998) and are successfully integrated with other sources of evidence. Moving forward, we must begin to understand more holistically what is occurring in the long-term, without losing sight of the people and groups who ultimately create the patterns we are observing. A synthetic and cohesive study can make the best use of the material available and perhaps avoid being solely quantitative, and more qualitative.

Following on from the framework for long-term studies of settlement patterns and population trends laid by the surveys of Adams, and the concepts of full-coverage survey employed with good results by Sumner (1972; 1990b), this dissertation intends to deal with spatial dynamics of long-term population trends in southwest Iran. The concept of a highland/lowland dichotomy is already well established within the literature, and has mainly focused upon the two major regions of the Susiana Plain and the Kur River Basin, sites of the major polities centred on Susa and Anshan (Miroschedji 2003). Briefly, in this dissertation, long-term settlement trends spanning the sixth through third millennia BCE will be discussed for several key regions representing both highland and lowland environments. These data sets will be compared and considered in conjunction with issues such as settlement dispersal and agglomeration, changes in subsistence strategy, and demographic factors. The limits of such an analysis, as defined by different survey methodologies, data manipulation and data comparability will also be considered.

Therefore, there are three main avenues that have been pursued in this study:

- A review of major survey projects within southwest Iran, and a critique of the theory and methodology associated with estimating populations and charting population trends from settlement data at the site, regional and interregional level.

Issues of data standardization, and problems with chronological variations between regions will also be addressed.

- A comparison of aggregate occupied area and total number of sites per period for each of the main study regions to identify the major population trends and settlement formations in the long-term.
- Identification and comparison of overarching trends, and asynchronous patterns occurring between the highland and lowland regions of southwest Iran. These patterns will be discussed in terms of settlement patterns (i.e. dispersal and agglomeration), sedentary and mobile groups (intrinsically linked by common land use, a consequence of the natural environment), demographic factors such as migrations, birth and death rates, and the environment.

The time focus of this project will hopefully preclude becoming mired in single period debates. While such debates are integral to this study of highland/lowland interaction, through early villages to the origins of states, the goal of this study is to view each of these major and minor developments in the context of the *longue durée*.

2 Ancient and Modern Environment

2.1 Geography and Climate

Southwest Iran encompasses the low-lying alluvial plains of Khuzestan, the Zagros Mountains, and the intermediary foothills, each representing a diverse, but interrelated environmental setting for human settlement. From Kirmanshah and Hamadan, the Zagros run in a series of relatively parallel northwest – southeast folds. The less densely spaced folds, on the western side of the mountains form an area of foothills before coming upon the alluvial plains of Khuzestan (Fisher 1968: 17). "As the primary element in this structural pattern, the Zagros chains include a system of longitudinal valleys and basins...longitudinal valleys lying among the outer chains are usually broken into by cross-valleys. These "break-through channels" (e.g. that of the Karun into the Ab-i-Diz) were formed by faulting related to the general dislocation that gave rise to the contrasting relief zones of the Zagros to the east and the plains of Mesopotamia and basin of Khuzistan in the west" (Scharlau 1968: 190). It is the marked difference between the flatness of the western alluvial plains, generally with a slope of no more than one percent (Salmanzadeh 1980: 8), and the Zagros chains abruptly rising behind them that is highly impressive.

The environment of the southwest region lends itself to both sedentary and mobile modes of subsistence. The lowland plains, and intermontane valleys make up the majority of agriculturally productive areas. These areas along with the slopes and foothills, are also good for pasturage. Seasonal movement between the uplands and lowlands by mobile pastoralists and semi-sedentary groups is observed today in many ethnographic studies, and was probably just as beneficial for making the most of the natural environment in the past (Barth 1965; Beck 1986; Cribb 1991). Transhumant movement throughout this landscape reminds us that the Khuzestan plains and the Zagros mountain chains should not be seen as a strictly dichotomous set of environments but as complementary ones (Adams 1962: 110). The geography of the region creates two very important features: well-watered and productive plains and valleys of the highlands, and alluvial plains of the lowlands, and the nature of the passages between these regions through the Zagros Mountains. These features are the basis for the networks through which the movement of people, materials and ideas can occur. These areas have the potential for both cultivation and grazing and have been historically known to cycle between these two options. For example, the Mahidasht plain in the central Zagros is an agriculturally productive area that is equally good for pasturage. Le Strange gives us the Medieval Arab geographer Mustawfi's (mid 14th century) comments on the use of the land in this area. "The Mayidahst [sic] plain is described by Mustawfi as in his day dotted with some fifty villages, surrounded by excellent pasture lands that were well watered from the neighbouring hills" (Le Strange 1930:192). Reports on the development plans for Khuzestan published in the 1950s indicate that areas in the upper Khuzestan plains that are now the prime agriculture lands in Iran, were in the past used by mobile groups for grazing flocks and a bit of rain-fed agriculture (Spence 1956). However, remnants of large-scale irrigation systems from the Sassanian and Parthian periods indicate cultivation on a massive scale (Adams 1962; Moghaddam & Miri 2003; Wenke 1975).

When considering the modern environment, one should keep in mind how much it actually reflects the ancient conditions. This is why the evidence for climatic changes over the last 10 000 years will be evaluated. Studies of the geomorphology of Iran have indicated that "the regions of most active geomorphological change as the result of river action would seem to be confined to the outer flanks of the Zagros range." (Scharlau 1968: 191). The study area is therefore within the limits of this region of geomorphological change, and it is especially notable in the alluvial plains of Khuzestan and the intermontane plains and valleys of the Zagros because of river action (see Brookes et al. 1982; Kouchoukos 1998: 95-104). A consideration of these transformations and their effect on site survival will be discussed in the following chapter on survey in southwest Iran. The individual geography and climate of each primary region will be considered in further detail below.

Fig. 2.1 Map of southwest Iran showing study regions, and modern towns mentioned in the text.

2.1.1 Alluvial Lowlands – the Susiana and Deh Luran Plains

Two main geographic regions of the Khuzestan Plains will be focused upon in this study, namely the Susiana and Deh Luran plains. Khuzestan is basically "an extension of the great Mesopotamian alluvial plain into southwestern Iran" (Adams 1962: 109) lying between the Zagros mountain front and the border with Iraq. The lowland region is connected to both the highlands of the central Zagros and the southern Zagros through several major routes, and despite its general association with the Mesopotamian plains has also played a large role in the history of the highlands. In historical periods, the Khuzestan plain was one of the most agriculturally productive areas of Iran, but went into decline in the Middle Ages (Salmanzadeh 1980: 5). This is seen in the remnants of the massive irrigation systems that were in use during the Sassanian and Parthian periods (see Adams 1962; Moghaddam & Miri 2003). Arab writers between the 10th and 15th centuries note the massive irrigation works that were or had been present in the Khuzestan area, and the wealth of crops that were taken off the land, as well as the abundance of good pasture lands (Le Strange 1930:235-242). It was the redevelopment of the plain into an agriculturally, and therefore more economically, viable landscape that spurred much of the early research into the plain's settlement history, as many features of archaeological interest would subsequently be destroyed. The development plan focused on the development of irrigation systems and several dam projects that would see the plains reach a higher agricultural potential (Spence 1956).

Fig. 2.2 The Khuzestan Plains (Image from Google Earth

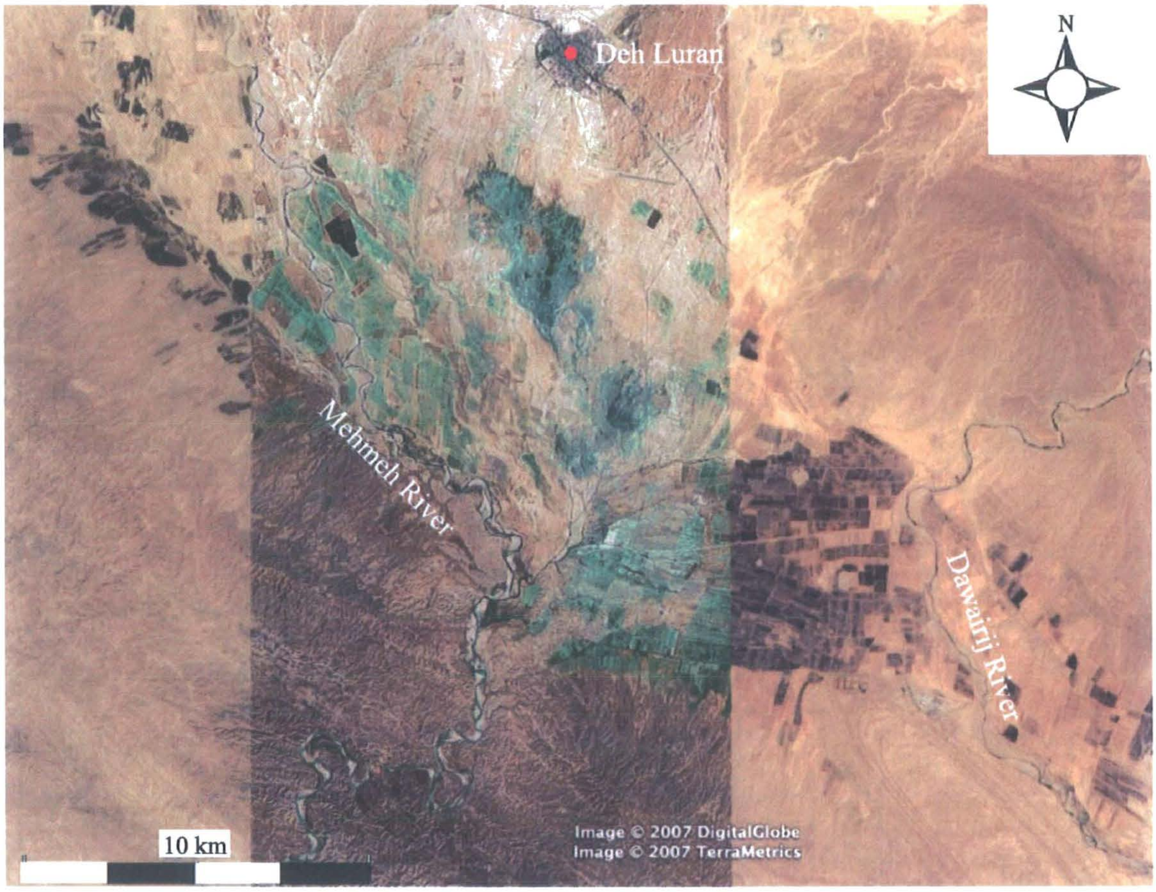

Fig. 2.3 The Deh Luran Plain (Image from Google Earth)

The plains cover an area of about 41 000 km^2 and benefits from the water of five important rivers: the Karkeh, Dez, Karun, Jarrahi, and Hindijan, and in fact receive more than a third of all of Iran's surface water (Salmanzadeh 1980: 5). Several northwest – southeast anticlines cross the plains acting as natural dividers between the lower, intermediate and upper Khuzestan plains. These divisions are defined as follows: the lower plains situated south of the Ahwaz ridge, the intermediate zone north of this to the Shaur Ridge, and the upper plains farther north yet extending to the front of the Zagros mountains. Adams (1962) described both the lower and intermediary zones as generally without prehistoric settlement, prior to the Sassanian period, but that the upper Khuzestan plains were and had been in prehistoric times the most suitable for agricultural development. Alizadeh (1992: 16) also divided the area into three "Climatic Zones" as follows: the arid zone, semi-arid zone, and the dry zone which follow the designations of the lower, intermediate and upper plains. The Deh Luran plain, situated to the northwest of the Susiana plain, is in most respects extension" (Kirkby 1977: 251). It lies between the Mehmeh and Darwairij Rivers and is fronted to the north by the Pusht-i Kuh and the front of the Zagros, while on the south it is hemmed in by the Jebel Hamrin ridge (see Fig. 2.3).

As previously mentioned the Khuzestan plains are of the same geological make up as the Mesopotamian plains to west. Dewan and Famouri (1968) characterize the valleys soils found in the plain and valleys of Iran, with arguably the most important being the alluvial and colluvial soils as they are the most conducive to exploitation for agriculture and grazing. Because of the nature of these soils they provide naturally good drainage. Within upper Khuzestan there are naturally occurring channels spaced about four to five kilometres apart that facilitate drainage (Salmanzadeh 1980: 8). In the plains there are also areas of marsh, sand dunes and extreme salinity due to poor drainage. The southern part of Khuzestan seems to have suffered most from the effects of irrigation without proper soil drainage, which has rendered parts of the area unusable for cultivation (Kirkby 1977: 253).

Most of the Upper Plains of Khuzestan fall between the 300 and 400 mm isohyets, indicating that dry farming is possible but the potential for better crop output is increased with the use of irrigation (see Table 2.1 for rainfall data). The more recent use of agricultural land in Upper Khuzestan indicates that within the area of the Susiana plain mixed irrigation practices were carried out, with areas of intensive irrigation along the Diz and Karun rivers. The majority of cultivated areas in both the Susiana area and the Deh Luran are watered by winter floodwaters and minimal irrigation. Dry farming is possible as well in areas of the Upper plains (Kirkby 1977: Fig. 102). Table 2.1 shows the average amount of monthly precipitation for selected regions. The rainfall data from Ahwaz and Dizful indicate that the majority of the precipitation falls between October and April, with very little or none in the summer months. The variation in rainfall between Ahwaz, which rests at 20 m a.s.l. and Dizful, which sits at 143 m a.s.l., shows the difference between the various climatic zones on the Khuzestan plains. Dizful, in the Upper reaches of the plains, receives more than twice as much annual precipitation as Ahwaz, situated farther to the south. The hot and dry summers, are in sharp contrast to the cool, wet winters, however even the coldest temperatures which occur in January are quite a bit warmer than the highland regions. July is the hottest month, with temperatures reaching into the mid forties (°C). Ganji (1968: 227) classes Khuzestan climatically as part of "The Persian Gulf Zone", which is generally characterized by higher temperatures than the rest of the country year round.

2.1.2 Central Zagros

The intermontane valleys and plains of the central Zagros provide some of the most hospitable areas within the mountain chain for sedentary settlement. In general though, the geography of the west central Zagros has given rise to a more mobile lifestyle based on a pastoralist economy and in many ways prevented a cultural homogeneity between the highland and lowland regions, but not limited their interaction (Abdi 2002: 75). This area lies to the north and east of the Khuzestan and Mesopotamian plains. Favoured with perennial water sources due to springs and snow-melt, the intermontane valleys and plains which have the most potential are found in the Karkheh and Karun river basins. Many of these areas are suitable for agriculture, but are impossible to irrigate because the streams running through them are so deeply incised, and water would have to be diverted upstream or lifted. This means very productive land is left for use as pasture, a necessity for mobile pastoralist communities especially those practicing transhumance into the highlands during the summer (Oberlander 1968: 275).

Ahwaz (20 m a.s.l.)

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Max temp °C	17.7	20.7	25.3	32.3	38.9	44.5	46.1	45.9	42.1	36.0	26.0	19.2
Min temp °C	7.8	8.2	12.2	17.1	22.0	24.9	26.9	25.6	21.3	17.3	12.8	8.6
Rainfall (mm)	33.5	25.2	16.9	17.3	3.5	0	0	0	0.1	1.8	26.7	33.5

Dizful (143 m a.s.l)

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Max temp °C	19.0	20.5	24.1	31.2	37.7	43.9	46.2	45.6	42.7	36.6	26.8	19.6
Min temp °C	8.7	9.3	12.0	17.6	23.4	26.9	30.3	30.2	26.5	20.7	14.7	10.0
Rainfall (mm)	65.0	45.9	48.6	30.3	4.0	0	1.0	0	0	5.0	80.0	75.6

Kirmanshah (1322 m a.s.l.)

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Max temp °C	8.4	10.3	13.8	19.8	25.9	33.0	37.2	36.5	32.5	25.6	15.6	9.7
Min temp °C	-3.5	-3.1	0.4	0.5	7.6	10.9	16.0	15.0	10.0	5.4	1.3	-1.9
Rainfall (mm)	37.8	46.3	67.8	68.0	30.0	2.9	0	0.1	1.3	12.3	55.3	50.9

Shiraz (1490 m a.s.l.)

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Max temp °C	12.4	14.6	18.5	24.1	29.8	34.9	36.9	36.0	33.5	27.6	19.8	13.5
Min temp °C	0.6	1.8	5.1	8.3	13.2	16.9	20.1	18.7	15.3	9.4	4.4	1.6
Rainfall (mm)	76.9	47.3	63.4	24.4	12.7	0	1.2	0	0	Trace	65.3	93.4

Table 2.1 - Monthly temperature and precipitation in selected areas (data from Ganji 1968: table 5, 246-249)

Ahwaz	Dizful	Kirmanshah	Shiraz
158.5 mm	355.4 mm	372.7 mm	384.6 mm

Table 2.2 - Annual Rainfall (data from Ganji 1968: table 5)

Access through the Zagros mountains is limited in this region to several established routes, of which the most famous is the 'High Road', or 'Great Khorasan Road'. "This route runs from the vicinity of Baghdad in central Mesopotamia up into and across the central Zagros mountains of Luristan, through a series of fertile highland valley systems, including the archaeologically well-explored Mahidahst and Kangavar valleys, and eventually out onto the high plateau of central Iran, east of the mountains" (Henrickson 1994: 86). It also runs through the Islamabad plain, where the principal central Zagros study area is located. The Islamabad plain is actually a group of intermontane plains and valleys, in the region of the modern town of Islamabad-e Gharb, 60 km west of Kermanshah. Abdi (Abdi 2002) used the all-encompassing term Islamabad plain as he saw that while these plains and valleys were at times separated by several geographical features such as ridges, the entire area all depended on the same water source, the Ravand River. The west central Zagros Mountains are part of the folded chain, and consist of the relatively parallel northeast – southwest running anticlines mentioned earlier. Whilst many parts of the mountainous terrain are barely passable, let alone suitable for agriculture or grazing, the alluvial plains and surrounding slopes present opportunities for both. These relatively small areas contain both alluvial and colluvial soils better suited to both activities (Dewan & Famouri 1968: 258). The alluvial plains and valley bottoms are generally cultivated, while the slopes surrounding such areas consist of some colluvial soils that can be dry-farmed (Abdi 2002: 90).

The Islamabad plain falls within the 300-400 mm isohyet, and receives most of its precipitation in the winter months. The annual rainfall amount as reported by Ganji (1968: table 5) for Kermanshah, is 372.7 mm, indicating dry farming is possible. Temperature data from Kermanshah indicates that January is the coldest month with temperatures hovering around the freezing mark. July is hottest month, typical of the rest of the country, although it is substantially cooler in the highlands than it is in the lowlands of Khuzestan

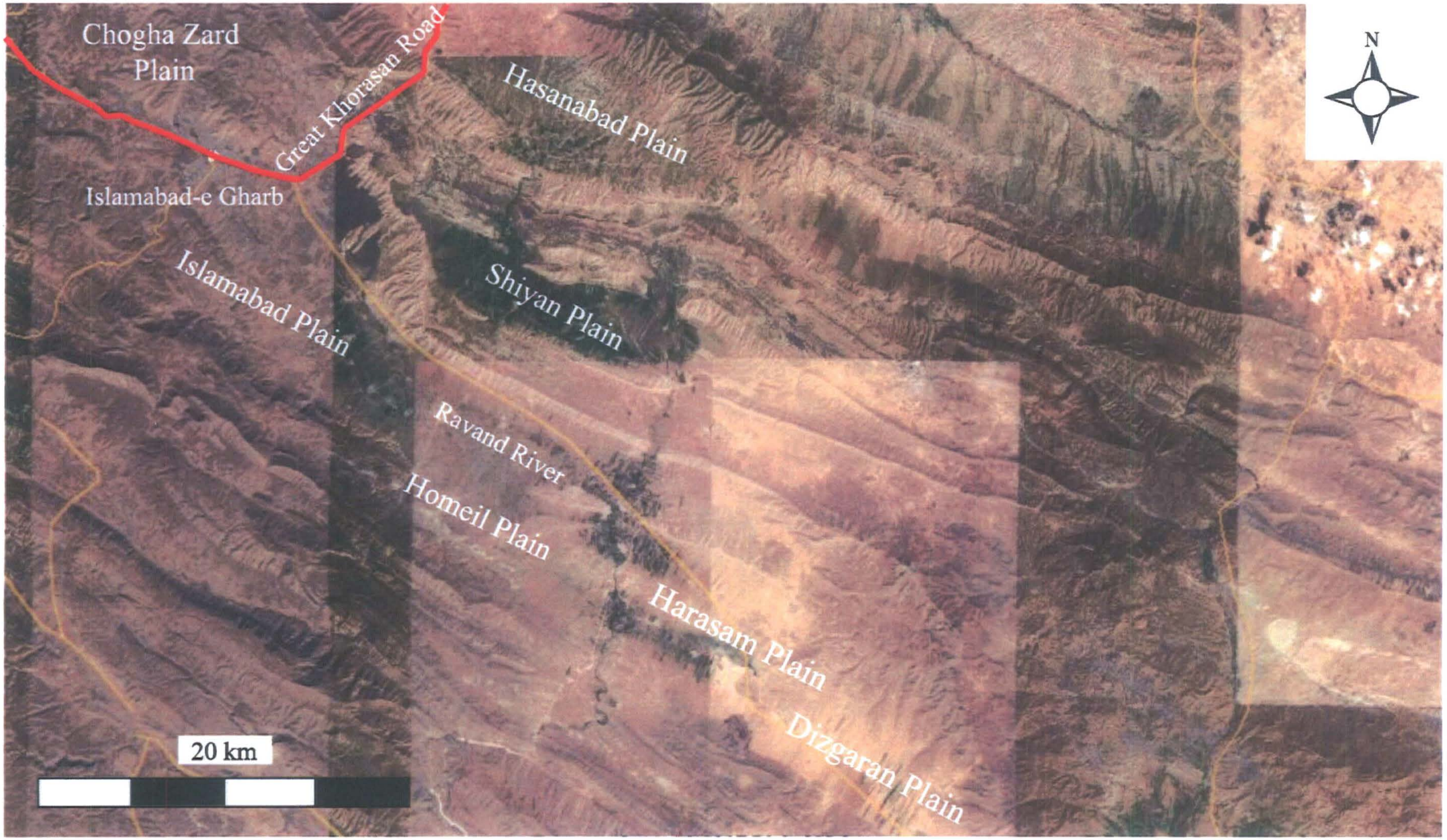

Fig. 2.4 The Islamabad Plain in the Central Zagros (Image from Google Earth)

2.1.3 Southern Zagros

The Marv Dasht plain is located in the Kur River Basin, north of the modern town of Shiraz. Located within the Zagros chain at the point where the north-west, south-east running mountains switch to an easterly direction. In this area ridges become broken mountains and basins become more common (Sumner 1972: 7-9). Of most concern is the area between the Kur River Basin and the Sivand river to the south. Within the Kur River Basin area there are many alluvial and colluvial soils suitable for agriculture and pasturage. Further up the slope of surrounding mountains the soils become rockier and less suitable for cultivation (Dewan & Famouri 1968: 258). The lower valley of the study area is very flat and covered in thick layers of alluvium (Sumner 1972: 13). Dewan and Famouri (1968: 251) indicate that the southern part of Iran has a "desolate character" due to the Zagros mountain formations that run through Fars and their geological composition. The valleys are generally composed of marly material, with the anticlines of a harder limestone (Sumner 1972: 13).

The Kur River Basin area generally falls in the 200 – 400 mm isohyet range, with small portions of it receiving more annual rainfall (Sumner 1972). The annual amount recorded for Shiraz is 384.6 mm (see Table 2.2). While dry farming is possible there are traces of ancient irrigation systems dating to the Islamic and Achaemenid periods, with the possibility of much earlier systems, which indicate that the agricultural productivity of the region could be greatly increased by artificial means (Sumner 1994: 52). Medieval Arab geographers such as Ishtakri and Yakut, comment on these impressive water systems: "The plain of Marvdasht was famous for its corn lands, being well irrigated from the dams on the Kur" (Le Strange 1930: 279). Being still within the Zagros chains the climate is somewhat comparable to that of the central Zagros, with winter temperatures being slightly warmer, although the area is cooler than Khuzestan all year round (see table 2.1). The coldest month is January and the warmest is July, a pattern consistent with the rest of the country. There is virtually no rain between May and October. Being cooler than the lowlands of Khuzestan, the upland areas like the Islamabad plain of the central Zagros and the Kur River Basin would be favoured areas for the summer campsites of transhumant pastoralists.

2.2 Hydrology and the Zagros Defiles

Because of the nature of the hydrological systems in southwest Iran, it is important to consider them as a whole instead of as separate units. The following discussion is largely based on Oberlander's (1968: 266-275) work on the riverine geomorphology of Iran. One of the most interesting features of the drainage systems in this region are the habit of rivers and streams to break through the parallel mountain ridges instead of following along them, a feature which Oberlander describes as "one of the world's most impressive displays of anomalous transverse drainage" (*ibid.*: 274). It is these passages that enable the movement of people and animals from the highlands to lowlands and back again. Understanding the nature of the river systems in southwest Iran is therefore integral to understanding interregional population trends and their linkages. Far from being deterministic factor, these passages allow networks to function. In times when we see increased evidence for sedentary populations in both the highlands and lowlands there is probably lesser use of these passages except by strictly nomadic groups. However these passages are still in use by these nomadic groups and the knowledge of the defiles must still be within the sedentary communities. Therefore, when we see the subsistence patterns shifts toward the more mobile end of the continuum, this knowledge is again put into practice. Therefore, it is imperative to reassert the dual use of good land in the plains and valleys of both the highlands and lowlands. When a more mobile lifestyle is preferred and we see a decrease in the amount of sedentary populations inhabiting agriculturally productive plains, we should possibly be more inclined to see it as mobile populations inhabiting pastorally productive plains.

Fig. 2.5 The Kur River Basin (Image from Google Earth)

The largest and most important river that runs through the study area is the Karun, which originates in the Zagros to flow downward into Khuzestan. Many of the streams that water this plain find their origins in the Zagros and generally have large catchment areas constantly fed by melting snow and springs. Due to this they do not dry up during the hot months of summer and continue to flow at a substantial rate; the minimum flow, at the point they escape the mountains, of the Karkheh is 880 cubic feet per second, the Dez 1765 cu feet per second, and the Karun at 3000 cu feet per second. However, the water in these Zagros regions is only in surplus in the winter months. In the spring the water levels rise and make many of the highland streams treacherous to cross thereby inhibiting the movement of transhumant groups. Because of this spring surplus there is the risk of severe flooding on the Khuzestan plains at this time. There is also an effect on the amount of water distributed by these streams as one moves further down the Zagros chain towards the south. Here, in Fars, there is less water than in the central regions and therefore more excessively dry conditions in the summer.

Many of the streams of the Central Zagros flow down into Khuzestan to water the alluvial plains. Of the major rivers and their tributaries that flow through Khuzestan, the Karkheh, the Dez and the Karun are the most important and make these plains some of the most well watered in all of Iran. These rivers "funnel the runoff from 45000 square miles of High Zagros into this plain of 15000 miles squared" (Oberlander 1968: 275). The most important water sources in the Islamabad plain are various springs and the Ravand river, to which almost all of the springs drain. Several of these springs are major water sources within the plain; the Arkavazi of Khaman spring has a median output of 200 litres per second, while the Mileh-Sar spring has an output of 130 litres per second (Abdi 2002: 90).

The major streams of the southern Zagros, unlike the ones in the central region, never flow beyond the highlands. The Kur, and the Pulvar are the most important to settlement in the Marv Dasht, and these two rivers "follow longitudinal valleys among the ranges, eventually becoming confluent on the Plain of Persepolis and terminating in the shallow Nairiz lake" (Oberlander 1968: 272). The Sivand River also flows south of the Kur River Basin area and is integral to this study. The catchment area of the Kur River Basin and the Sivand, respectively are 20 000 km^2, and 10 000 km^2, with the Kur River having a surplus of 100 mm a year, although like most of the Zagros streams this is only in the winter (Sumner 1972: 14). The presence of this hydrographic pattern would partly explain the favourable conditions for settlement within the Kur River Basin that led to Tal-e Malyan being the largest urban centre in the highland region during the fourth and third millennia BCE.

2.3 Palaeoclimate

Information on the ancient climate of Iran has been obtained through the study of pollen cores, stable isotopes, geochemical and charcoal analysis from various lakes within the region. The records that are of most concern for this study begin around 6000 BCE; however, there will be a consideration of the climate since the beginning of the Holocene (around 10 000 years ago). An understanding of past climatic conditions and how closely they resemble today's environment can help us to better understand settlement patterns and population trends. For example, recent research has started to explore the connections between ancient climatic changes (i.e. arid conditions) and human responses in the form of settlement abandonment, and the collapse of empires (Stevens et al. 2001: 753; Wick et al. 2003: 673).

Mg/Ca ratios from Lake Van in southwest Turkey, have revealed levels of paleosalinity that are very much similar to today's over the last 3400 (that is varve years before 1990) years. However, low levels of salinity between 8190 and 3400 years ago indicate a much higher lake level (Wick et al. 2003: 667). This data can be coupled with data obtained from oxygen isotope analysis, which indicates high levels of relative humidity compared to the Pleistocene. The early Holocene is characterized by dry conditions but between 6200 and 4000 years BP the climate became even more ideal for oak and pistachio forest, which subsequently expanded (*ibid.*: 671). Low levels of charcoal at this time also indicate that there were fewer forest fires, which can be indicative of higher levels of humidity (*ibid.*). This would allow for an interpretation of wetter overall conditions in the middle Holocene.

Pollen cores (van Zeist & Bottema 1977; van Zeist & Bottema 1982) and isotopic analysis (Stevens et al. 2001) from lake Zeribar give us similar information about palaeoclimates. Through analysis of pollen cores Van Zeist and Bottema (1982: 278-279) have indicated that in the early Holocene (10,500 – 6000 BP) that the climate "was relatively warm and dry" and an oak and pistachio steppe was likely, but that between 6200 – 5400 BP it was replaced by oak forest. Oxygen isotope analysis from lake Zeribar (Stevens et al. 2001: 753) indicates that while there was an increase in moisture in the early Holocene lake levels were still low giving an indication of the season in which precipitation was falling. Different levels of $\delta^{18}O$ are deposited seasonally with more being detectable in spring/summer, therefore an increase in overall moisture, but decrease in $\delta^{18}O$ levels indicate most of the rain was falling during the winter months with very little precipitation during the summer. This would support warm and dry conditions, at least seasonally. By the Mid-Holocene, corroborating van Zeist and Bottema's conclusion of an oak forest, $\delta^{18}O$ levels are higher, and "there is an interval of overall greater effective moisture than the early Holocene in many regions of Southwest Asia" (*ibid.*). In the Late Holocene, there appears to be a quite drastic change in overall moisture. Around 4100 – 2100 years BP there is a shift to a very arid climate with interesting implications for demographic changes (Lemcke & Sturm 1997; Wick et al. 2003: 670).

There appears to be a time lag between the spread of trees in Lake Van and Lake Zeribar, with Van lagging behind by several thousand years. Pollen records indicate an increase in humidity at the beginning of the Holocene for most of the Near East. In the interior area, like those of Lake Van there was a several millennia lag, and humidity did not rise until about 8200 yrs BP (Wick et al. 2003: 673). Van Zeist and Bottema (1982: 293) postulate that the climate of Lake Van was more arid than Zeribar in the early part of the Holocene. Whatever the reason for the difference in the Holocene climatic conditions of these two areas, this evidence highlights the regionality of development. I think it is prudent to note how differently climate change would have affected different areas, and how varied the human responses elicited would have been.

Kirkby's (1977: 272-283) study of proposed ancient river courses suggests that in the past, instead of the present pattern of erosion, that the Susiana and Deh Luran plains were areas of aggradation, and that all of the main rivers in this area were aggrading simultaneously. He implies this process began somewhere between 8000 and 6500

BCE and did not cease until about 2000 BCE, or at least before 500 BCE. (see Brookes 1982 for a contrasting opinion) Under this regime the conditions for agriculture would have been quite different. Aggradation can be caused by various factors, but in this case it seems most likely that those factors are climate change and possibly the impact of grazing on the environment. Kirkby (1977: 283-285) supposes that the warm and dry climate in the early Holocene, that began in the late Pleistocene caused upstream erosion that moved farther down stream, which stabilized with the possible help of a wetter climate since about 4000 BCE, consistent with the more moist conditions of the mid-Holocene indicated by oxygen isotope levels and the pollen data indicating oak forest from both Lake Van and Lake Zeribar. Kirkby also includes grazing as a possible contributory force in aggradation as grazing causes erosion, and the start of aggradation at about 8000 BCE comes at a time when animal domestication would have begun to be important enough to begin to make an environmental impact. Climate change is not a unicausal factor for culture change, but observing it may lead us to a better understanding of human settlement pattern responses and adaptations.

3 A History of Survey in southwest Iran

3.1 Introduction

This chapter will summarize a number of surveys undertaken within southwest Iran in the last half century and will focus on several key areas. It is important to review this material if one intends to make any comparative inferences about long-term population dynamics and changing settlement patterns. The type and intensity of survey and agenda of the archaeologist all contribute to producing varying quality of data and can limit the accuracy of any analysis based upon it. In dealing with this topic, the focus will be on the projects that encompass the geographical areas and time span chosen for this analysis, and those that could be considered integral to the study of long-term population trends in southwest Iran. Therefore, I will primarily be discussing the key surveys of prehistoric sites on the Susiana and Deh Luran plains of Khuzestan, the Islamabad plain in west central Iran, and the Kur River Basin in Fars. A more complete review of survey and excavation in the region can be found elsewhere (Hole 1987c) and therefore will not be repeated here. This review will be presented regionally, and whenever possible chronologically, beginning with the lowland regions of Khuzistan, then the central Zagros Highlands, and finally the Southern Zagros of Fars. A brief mention will also be given to other regional surveys conducted in Ram Hormuz, Patak, Izeh and Mahidasht regions. With this information in mind, the various approaches to regional survey, and natural and cultural influences affecting site survival, which must be factored into any methodology will be discussed. By examining gaps in our current understanding of the region and using approaches and suggestions from the greater Near East, survey can be critically reviewed and our current understanding can be built upon.

The goal of this study, in considering links within southwest Iran, is not purposefully neglectful of regions outside of the modern borders of Iran. Mesopotamian influence cannot easily be ignored in a discussion such as this, but for reasons of manageability Mesopotamia will not be the focus of this work, nor will it be treated with the same intensity as the primary study area. Because of modern political and cultural affinities there may be a tendency to remain within the modern country's boundaries.

However, it must be remembered that Mesopotamia and Southwest Iran were intrinsically linked throughout the millennia.

3.2 Survey Frameworks and Methodology

Early examples of survey in southwest Iran were conducted by Jacques de Morgan (1900), as part of the *Mission scientifique en Perse*, who first looked at the Susiana plain in its geographical context in 1900. Under the banner of the same project Gautier and Lampre (1905) described and mapped the Deh Luran plain, as part of reconnaissance of sites near Tepe Musiyan. Aurel Stein (1940) covered many areas of western Iran in his general survey in 1936. However, these projects were not concerned with answering questions about the relationships within and between regions, or with an awareness of settlement patterns and population trends. The motivation behind a lot of early survey was more or less to seek sites that were suitable for excavation (Redman 1982:375). In 1959 Robert Braidwood, leading the Iranian Prehistoric project, surveyed the Mahidasht region (Braidwood et al. 1961). This project was the first of its kind in central west Iran with the purpose of investigating the prehistory of the central Zagros (Levine & McDonald 1977). Braidwood's (1937) previous work in the Amuq region in Turkey demonstrated an agenda that moved beyond site selection. Using the naturally delimited boundaries of the region, he sought to name, map, and assign occupation to sites while noting their environmental context.

To fully appreciate the type of data recovered and any interpretations made based on survey data, it is necessary to understand the types of questions that framed this research. During the 1960s and 1970s many surveys, and indeed much of the archaeological research that was being conducted in the Near East in general, were problem-oriented studies geared towards discovering the origins of agriculture, irrigation, urbanization, and imperial programs. (Adams 1962; Alden 1987; Carter 1971; Hole 1969b, 1985, 1987c; Johnson 1973; Levine & McDonald 1977; Miroschedji 1981; Neely & Wright 1994; Schacht 1976; Sumner 1972; Wenke 1975; Wright 1969, 1979; Wright & Carter 2003; Zagarell 1982). These theoretical leanings coloured the approach to survey and the results pulled from them. Undoubtedly though, the expansive, and functional approaches taken in much of this research produced some very systematic and complete studies, which (if a bit naive in their original goals) are without question incredibly informative. Since then, very little regional survey has been feasible for foreigners in the region and the few surveys that have been conducted have included a focus on the identification of mobile pastoralist occupation (Abdi 2002; Alizadeh 2003a) and salvage projects (Moghaddam & Miri 2003).

There are many views on the intensity with which archaeological survey should be practiced. Intensive sampling techniques, while making sure that smaller sites are not underrepresented, are time consuming and labour intensive. Sumner (1990b: 103) points out that a major drawback of sample survey in trying to provide a regional pattern is that the samples are not large enough to deal with "structural variables" and therefore the "organizational scale". There is also the risk of generalizations being made for entire regions (*ibid.*:105). The larger picture should not be lost in a patchwork of small surveys with no connectivity. Blanton (2001: 628) has criticised Mediterranean archaeology for a similar "localism", which has researchers looking more closely at smaller and smaller units, moving away from the large-scale regional analysis which seem in the prevailing methodological arena as less refined. Overall, Blanton surmises that "Mediterranean survey archaeology as a whole has lost interest in the kinds of large-scale social and demographic processes that engaged earlier researchers and, instead, now prioritizes high-resolution methods over theory and problem orientation" (*ibid.*: 629). Redman (1982: 377-8) argues that rather than increased intensity of survey "one should aim for adequate coverage; adequate in relation to the interpretive problems being pursued, and adequate in a sense of being able to estimate to what extent sites have been found".

Without a doubt though, full-coverage regional survey is, as it has been applied in southwest Iran, one of the most useful techniques in determining long-term patterns of settlement, and defining the nature of entire regions (see Sumner 1990). A lack of theoretical framework has led some to question the chances of regional survey being taken seriously as a tool in this endeavour. Sumner expounds the need for "an explicit theoretical model of the archaeological record and the implications of that model for survey methodology" (Sumner 1990b: 92). Despite the undoubted usefulness of regional survey, there is a need, as Redman suggests, for more accuracy and the incorporation of more intensive sample survey within the larger regional survey seems the most logical way (Wilkinson 2000). Undoubtedly, in order for a regional study to be useful in an interregional comparison, one needs to be able to contextualize its place in the wider regional system, after which, more focused sample survey can help to fill in the gaps.

3.3 Geomorphological and Cultural Processes

Site survival is easily one of the biggest impediments to a more complete settlement record from survey data. Ancient and modern human activities, especially agricultural practices are also detrimental to the preservation of earlier settlement, often obscuring and in some cases obliterating it completely. These practices include ploughing, and planting which conceal low lying artefact scatters, as well as anthropogenic sediment used for fertilizer (Wilkinson 1982). Major irrigation systems which were implemented on a massive scale during the Sasanian and Parthian periods are also very likely to destroy earlier settlement and activity patterns (Alizadeh et al. 2004; Alizadeh & Ur 2007; Moghaddam & Miri 2003). Repeated habitation on tells, a common enough occurrence in the Near East, is a perfect example of later settlement obscuring earlier occupation. Archaeologists may also be unable to survey or excavate in areas of modern cultivation or habitation.

Wilkinson (2000) employs the concepts of "landscapes of destruction" and "landscapes of survival" as adopted from Taylor (1972), in describing the nature of site survival in differential zones. These are useful terms in considering the differing environments in which we seek to elucidate early settlement and population trends. The dichotomous nature of southwest Iran is well represented by these landscapes. With generally continuous settlement in the lowland alluvial plains (i.e. Susiana, Deh Luran) and upland valleys (i.e. Kur River Basin), there is a considerable amount of the archaeological record that is forever unrecoverable. In its more marginal areas, mostly in the highlands, we can expect to find landscapes of relatively good preservation, as they have not suffered the burden of millennia of continuous occupation. However, these imprints are generally laid by less permanent forms of settlement.

Equally the geomorphology of a region must also be understood in order gauge the degree of site recovery, as geological processes are just as important as cultural processes when it comes shaping the nature of a site as we see it today (Kirkby & Kirkby 1976) . An example of this, is alluvation, which can completely bury earlier settlement, making estimations of settlement pattern and density extremely tenuous. Brookes et al. (1982), are wary as to the authenticity of any overarching observations about settlement patterns based on survey data because of the destructive nature of major alluvial events obscuring earlier settlement patterns. In their study of the Mahidasht they found that early sites, that is, those settled before the Bronze Age were usually found in the piedmont or on the edge of alluvial fans, as the thickness of deposition decreases (*ibid.*: 295). This observation has implications for both lowland alluvial plains, such as those of Khuzestan, or the highland valleys. Overall, there is a variable amount of sedimentation that has taken place in diverse regions, and this will affect the archaeological record differently. When trying to reconstruct population trends of the earliest periods of village life, one should be aware that the data set may not represent the complete settlement pattern (Kouchoukos & Hole 2003; Wilkinson 2003b).

The southwest Iranian highlands present another unique environmental niche for which survey frameworks need to consider natural and human processes and develop methods to deal with them accordingly. Banning (1996) has implemented methods of recovering buried settlement along wadis in the highland regions of the Levant with much effectiveness. Alden's (1979) survey of the talus slopes surrounding the Kur River Basin in Fars provides another example of modifying survey framework to extend the coverage of valley survey to include the surrounding marginal environment (Sumner 1990b: 104). In general, we must recognize that the above-mentioned processes need to be considered when building a methodology and when reviewing the results of earlier survey projects. The recoverable archaeological settlement patterns that we see today are the cumulative product of past and present processes that can only be deconstructed through a thorough review of the cultural and geomorphological factors that have been in operation.

3.4 The Lowlands

3.4.1 Susiana

Regional survey gained a lot of ground as an important aspect of archaeological study in the Near East with the work of Robert Adams in Iran (Adams 1962), and Mesopotamia (Adams 1965, 1981). It was with Adams's survey of Khuzestan in 1962 that intensive archaeological survey really demonstrated its potential in southwest Iran. Adams's survey was done preceding a wave of modern agricultural programs that transformed the landscape of southwest Iran, and consequently destroyed many features of archaeological importance. He recognized that a large amount of valuable information could be acquired by comparing development plans in the mid 20th century to ancient agricultural programs (Adams 1962: 109). While he saw the value in likening Khuzestan, environmentally, to Mesopotamia and therefore saw it as having had the potential to develop similar socio-political characteristics, he notes that contemporary research showed that Khuzestan had an environmental profile that was entirely unique. Adams included all sites he identified from every period and built up a picture of changing settlement patterns from about 6000 BCE through the Middle Ages to the 19th Century. By blending various aspects of geography, geology, history, and archaeological survey he was able to build a sweeping picture of long-term human occupation in a wide and varied geographical, socio-political and economic landscape. Adams approach was pioneering in that it provided an overall framework from which broad assumptions could be made. Redman notes Adams' keen awareness of this non-intensive approach and subsequent concern for probable missed sites (Redman 1982 :376). However, as a source for overall understanding of regional dynamics, and as a stepping-off point for more intensive approaches Adams' work is an invaluable resource.

Other surveys of the Susiana plain that followed took various period-oriented approaches. Following Adams' work, Frank Hole conducted the next comprehensive survey of the Susiana plain (Hole 1969a, b), the results of which were used in his interpretation of the village period (Hole 1987c). Hole's survey shed light on the sixth and fifth millennia with a concern for establishing a more refined periodization, which he saw as the greatest impediment to the correct interpretation of survey data

(Hole 1985). Robert Schacht surveyed again in 1974 (Schacht 1976) and focused on the Proto-Elamite periods. Concerned with occupation in the Susa III period, John Alden revisited twenty nine sites on the plain (Alden 1987). He describes a pattern consisting of a few small settlements and a corresponding population decline (*ibid.*: Table 28; Table 29) useful for information on this period. Unfortunately, the ceramics recovered in the systematic sampling of two Susa III sites have not been analyzed (*ibid.*:159). Elizabeth Carter (1971) also surveyed the plain specifically focused on the Elamite periods.

The question of Uruk occupation on the Susiana plain was addressed by Gregory Johnson's (1973) survey. His original aim was to resurvey all sites with noted Uruk occupation, but eventually he extended the survey to cover the majority of visible sites (*ibid.*: 24). His survey revealed over 60 sites occupied during the Terminal Susa A and Uruk phases; however, he notes that these were only the sites visible above the present alluvium and larger than one hectare in size, which eliminates any low-level sites (*ibid.*: 25). Johnson made an attempt to employ an intensive sample survey over several sites but was only able to do so on two sites because of time constraints. If feasible, such studies would undoubtedly increase our knowledge of Uruk chronology. Despite surveying multi-occupational sites, only Uruk ceramics were collected (*ibid.*: 30). Johnson relied heavily on statistical analysis of type counts from his survey, which he admits may push the boundaries of interpretation but has compensated by presenting complete data sets that are useful for future reanalysis. This study's major contribution results from his correlation of ceramic types in various Susiana excavations to better define the Uruk chronology. For the Terminal Susa A and Uruk periods, Johnson presents thorough data on site size and occupation period useful in estimating populations. A proliferation and decline of settlements in the above mentioned periods are noted in his analysis of settlement patterns and population estimates. He notes, quite perceptively that "the proportional relationships between estimates are probably far more reliable than the absolute values of estimates themselves" (*ibid.*: 66), an observation quite useful when trying to identify gross patterns of growth and decline.

Wenke (1975: 33-4) focused on the development of the Parthian and Sassanian empires' interest in the region in the form of possible cash-cropping, intensive irrigation, and the correlation of these phenomenon with unprecedented population growth that had been noted in previous survey. The results of his survey of the Susiana plain included the identification of over one thousand sites. This was more than three times the amount recovered on any previous or later survey of the plain (Kouchoukos & Hole 2003). A substantial amount of material regarding these later periods was laid out in this study but unfortunately no comprehensive list of the prehistoric sites identified on the plain is accessible. Because there was no pre-existing ceramic typology for the Parthian and Sasanian periods on the Susiana plain and due to time constraints, there is room for error in his period designations (Wenke 1975: 47). However, the vast number of sites he located indicates the prolific nature of settlement over thousands of years on the Susiana plain.

The survey material collected by F.G.L. Gremliza during the 1950s and 1960s differs greatly from many of the aforementioned surveys that were done in Khuzestan. Significantly, Gremliza was not an archaeologist and did not have an express agenda intent on solving the problems posed by processes such as early state formation. The ceramics collected during his time in Khuzestan as a doctor, were analyzed and published by Abbas Alizadeh (1992). Gremliza gathered only painted sherds from the mounds he spotted on his travels around Khuzestan and noted the location of the site on a map. This method excluded the collection of non-painted sherds, and biased collection toward the prehistoric periods, especially the fifth and early fourth millennia (*ibid.*: 3). Most likely, non-mounded sites would not have been as easily visible and therefore no collections would exist for these types of occupations. Alizadeh's analysis of the forty-five sites recorded by Gremliza presents the data in its original geographical context and tries to compare it to surveys in other areas (*ibid.*: 37). By doing this he does not compromise the integrity of the data and will allow it to be analyzed in future in its original context. No designations of aggregate occupied area per period are possible because of the nature of data collection. With this survey being one of the earliest on the plain, there is a greater chance that many of the sites have since been destroyed by agricultural development, in fact only four of the sites surveyed by Gremliza can be correlated to Adams'(1962) survey (Alizadeh 1992:59).

One of the most recent surveys in the lowlands of Susiana was embarked on as a salvage project. In 2001, Moghaddam and Miri (2003) surveyed the Mianab plain with the intent on recording ancient water systems and their relations to settlement patterns and population dynamics. Most interestingly the development that was going to threaten archaeological remains in the area was the reinstitution of an ancient water system that would be more efficient than the modern one. Aware of the problem in recovering the earliest prehistoric occupations due to various cultural and geomorphological processes, they found very little evidence for these early settlement patterns, but this is most likely a problem of alluviation as demonstrated by Alizadeh et al (2004), however the increase in population from the Elamite periods onwards is quite apparent (Moghaddam & Miri 2003: 100-1). Clearly demonstrated, especially for the Parthian period is the correlation between water control systems, settlement density and population, leading to the assignment of these massive irrigation systems to this period (*ibid.*: Fig 7; 103).

Because of the considerable number of surveys that have been conducted on the Susiana plain of varying intensity, and geographical and temporal interest, it is easily one of the most complete regional survey records in the Near East. Depending upon the agenda of the excavator, these projects have been carried out with the intent of recovering various types of information on differing periods. The way in which sites are classed according to period is a concern shared by many of the surveyors themselves (Kouchoukos & Hole 2003). With each surveyor choosing his or her own sequence of cultures on the Susiana plain, it can be difficult to find a common ground for comparison. However, "comprehensive maps of all the know Susiana sites with a common numbering systems will have to wait until detailed reports of all the surveys are published" (Alizadeh 1992 :4) Recently, Kouchoukos has undertaken an analysis of all the accessible Susiana sherd collections of the sixth through fourth millennia and collated them providing a clearer picture (Kouchoukos 1998). This is an integral first step towards an integration of all the existing Susiana material.

3.4.2 Deh Luran and Patak

While brief surveys had been done previously on parts of the Deh Luran plain, it was Neely's 1969 attempt that methodically recorded many of the sites in the area (Neely & Wright 1994). Prior to this, most of the survey on the Deh Luran seemed to have been geared towards identifying settlements that, if excavated, had the potential to shed led on the big questions, i.e. the origins of controlled water systems and early urbanization. Cursory survey had indicated to Hole, Flannery and Neely, the potentiality of sites such as Tepe Farukhabad "for resolving problems of the development of urban life" (*ibid.*: 4).

The original goal of this survey did not include a reconnaissance of settlement on the plain but was designed to find and define "water control and irrigation features" and to reconstruct the ancient environment in which they existed using modern land use comparisons (Neely & Wright 1994: 7). However, because of the problems in dating irrigation systems and without a systematic study of the settlements to which these works related, there was no context. A site survey was added, and while the initial goal was to record all sites on the plain, because of time and site preservation, selective sampling had to be instituted, after which Neely and Wright estimate that seventy percent of the plain was surveyed (*ibid.*: 7). Awareness of the influences that prevailed in the 1960s regarding archaeological research is essential when considering the type of information collected and the types of questions asked. Neely and Wright are not ignorant of this fact and recognize that this was true of the questions they hoped to answer with their survey, such as the correlation between early agriculture, settlement patterns and irrigation, as well as population pressure as a causal factor in the growth of early urban centres (*ibid.*: 8). While all sites in the plain were recorded only the early periods prior to 2600 BCE have been published in a comprehensive volume. Population estimates based on estimates of persons per settled hectare and simulated estimates constructed using Dewar's (1991) methodology highlight a population decline in the second half of the fifth millennium and unprecedented growth in the Early Dynastic I-II (Neely & Wright 1994: fig. VI.1).

With this survey Neely and Wright have attempted to assign settlements of all the early phases beginning according to their chronology c. 5400 BCE, to irrigation channels from three major water sources (see Neely & Wright 1994, Chp. VI). The lack of dates for these channels and the inability to determine if they are contemporaneous with settlements of any specific period makes any interpretation tenuous. However, they are aware of this fact and state "If, in our effort to develop a more processual perspective on these variables and their relationships, we have pushed well beyond the limits of prudence, we hope at the least that we have raised challenges for future investigators" (*ibid.*:183). However in their focus on the use of irrigation on the plain, they may have ignored the wider land use patterns. Despite the questionable assumptions made, it was important to suggest the possibility of such a system.

Pierre de Miroschedji's (1981) surveys in Khuzistan were carried out in order to elucidate late second and first millennia occupation on the plain. His work consisted of a resurvey of all the sites identified from the above-mentioned time period in the vicinity of Susa, and an initial survey of the Patak region. While obviously clarifying the period designations of various sites, it is his work in the Patak region, which is of most concern here. Because of its geographical location between the Deh Luran and the Susiana plains, this survey presented important information on a previously unsurveyed region between two much better documented ones. Though his interests lay in later occupations, Miroschedji recorded all sites and assigned a preliminary phase of occupation (*ibid.*:175). Due to temporal and logistical constraints, Neely and Wright were unable to complete their investigation of the southeast part of the Deh Luran plain (bordering Patak), for which Miroschedji's observations about prehistoric occupation were invaluable (Neely & Wright 1994: 9). No area of occupation by period is given making observations about aggregate site size impossible. However, as an indication of settlement trajectories it is useful for comparisons to the adjoining regions. Miroschedji indicates that further survey needs to be carried out toward the north of the Imamzadeh Abbas Tal plain where they recorded several large tepes, but further investigation was not possible at the time (Miroschedji 1981: 172).

3.4.3 Ram Hormuz

The Ram Hormuz plain was surveyed in 1969 (Wright 1969; Wright & Carter 2003). This region was chosen because of its placement in relation to the more fully explored area of Susiana, and because of its location on a major route between this plain and the Kur River Basin in Fars. Because of its intermediary position, Wright was looking to find evidence of a population increase in the plain correlating to events occurring in either Susiana or the Kur River Basin (Wright & Carter 2003: 61). Various factors, of which the surveyors are now expressly aware, affected the type of data recovered in 1969. The survey was never completed for the entire region, and only mounded sites were sought. As a result very few early sites were located, but they more than likely exist (*ibid.*:65). Most interestingly, the observed settlement pattern highlights a break in occupation in mid to late 3rd millennium (*ibid.*:67), which is similar to the observed hiatus around the same time in the Kur River Basin (Sumner 1986).

3.5 The Highlands

3.5.1 Central Zagros – Islamabad Plain, Mahidasht Plain, and Izeh Plain

The Islamabad plain, which is actually a conglomeration of several smaller plains in the central Zagros, was recently surveyed by Kamyar Abdi (2002) . Sites of all periods were recorded from the palaeolithic to recent times, but specific focus was placed on Middle Chalcolithic sites. Influencing Abdi's choice of region and survey method was his focus on mobile pastoralism and more specifically, its emergence as an independent subsistence strategy. The intensity of his survey varied depending upon factors such as accessibility, distance, and modern agricultural use (*ibid.*:152; fig. 7.3). Much of the earlier survey projects in southwest Iran have neglected to look for nomadic sites, whether intentional or not. Abdi's goals included specific recovery of pastoralist camps and therefore appropriately focused on areas which were "contemporary migratory routes" (*ibid.*:180) and conducted ethnographic research to supplement the survey (*ibid.* 163). The results of his settlement analysis highlights a drop in permanent settlement in the Late Middle to Late Chalcolithic, which he sees as a shift toward a more nomadic lifestyle and the origins of transhumant pastoralism (*ibid.*:pg 181; Fig. 7.5) Most useful is the data on aggregate site area per period for both sedentary sites and camp sites from the Early Neolithic to Late Chalcolithic (see Abdi 2003: Fig. 18).

Henry Wright surveyed the plains of Iveh, Izeh, and the Dast- e Gol, marginal areas on the Zagros front range (Wright 1979) Wright was interested in elucidating the relationship between nomadic and sedentary groups at the time of early urban centres and political formations. Therefore, he saw these regions as prime areas for this type of problem-oriented survey, which would hopefully supplement the information that had been gathered in the more thoroughly surveyed lowland regions. However, as is quite often a problem he lacked a clear cut ceramic typology and no controlled stratigraphic excavation (*ibid.*: 18) In addition to this, the areas of Iveh and the Dast-e Gol were shortly to be submerged by a lake formed by the building of the Karun Dam, and so emergency surveys were conducted in anticipation of the event (*ibid.*:2) Unfortunately, this means that a good many of the sites have since been destroyed and could not be resurveyed intensively. In general his survey contributed to a better understanding of complementary highland areas, for comparison with the more fully explored lowlands.

The Mahidasht, originally surveyed as part of the Iranian Prehistoric Project, under the direction of Braidwood (Braidwood et al. 1961), was augmented by another survey in 1975 (Levine & McDonald 1977). The temporal constraints imposed by the excavators limited sherd collection to the Pottery Neolithic through Chalcolithic. In reference to sherd collection it should be noted that only painted wares were collected and used to define periodization (*ibid.*: 40). Between these two projects, about half of the valley has been covered, and the assumptions about settlement in the totality of the valley follow from this. Walking survey was not implemented in 1975, as it was in Braidwood's, except when modern agricultural practices required investigation on foot (*ibid.*: 39). Helpfully, as noted in earlier discussion, extensive work has been done of the geomorphology of the Mahidasht region (Brookes et al. 1982).

3.5.2 The Kur River Basin – Fars

A regional survey of the Kur River Basin contributed immensely to a previously understudied area and led to the discovery of the ancient highland capital of Anshan at Tal-i Malyan (Sumner 1972, 1986). Vanden Berghe (1952; 1954) had previously conducted survey in the region but not to the extent of Sumner. Sumner's (1990b) use of full coverage survey provided a good understanding of settlement patterns from the earliest village settlements through the millennia and has produced some of the best known population curves in southwest Iran. In the settlement pattern several peaks and troughs are apparent, most notably the substantial increase in population during the Bakun period, and the emergence of proto-Elamite settlements during a subsequent decline, as well as what appears to be a several hundred year hiatus in sedentary settlement after the Late Bakun (*ibid.*). Survey of the Kur River Basin provided key settlement information for a region surrounding a highland urban centre, a counterpart for the lowland region around Susa.

John Alden resurveyed many of the sites found previously to further define the Banesh occupation. (Alden 1979). Alden's survey highlighted one of the possible defects of full-coverage regional survey, with the discovery of 13 previously undocumented sites, especially low level sites (Sumner 1990b). More recently, in searching for the nomadic component of the Kur River Basin, specifically of the fifth millennium, Abbas Alizadeh (2003a) conducted a survey in 1995. He specifically sought archaeological settlement patterns that resembled those of modern pastoralists by revisiting sites and supplemented previous survey with the discovery of several new sites. Besides looking at mounded sites he also selectively focused on rock shelters, cave sites, and low level sites that would elucidate the settlement of more ephemeral populations. Sumner is aware of the benefits of his full coverage survey in elucidating the greater patterns, but also understands that his work was of a relatively low intensity, and thus low-level or temporary sites may have been missed (Sumner 1990b: 95). Therefore, the work of Alden and Alizadeh, to further understand a specific period, and to shed more light on the more ephemeral elements of a population, respectively, is essential to build a more complete portrait of a region. While there is quite a lot of research that has been, and continues to be, embarked on in the Zagros Mountains, we do not possess a record produced by the same sort of survey intensity seen in Khuzestan.

3.6 Summary

The previous discussion has explored the various methodologies employed as interpreted and implemented by their instigators. Sumner makes an important summation of the problem with regional survey " the term "full-coverage" generally indicates that the extent of survey coincides with the extent of the survey region, but carries no further implication concerning either the intensity or the selectivity of survey" (Sumner 1990b: 93). While a uniform survey methodology cannot be explicitly defined, perhaps it can be refined. The consequent analysis of any survey data is only as reliable as the raw data. Especially when endeavouring to base a study on comparative survey data, the variability of the methodology of the sources must be kept in mind. This variability is particularly apparent in the surveyed regions of southwest Iran. While an area like the Susiana plain is one of the best-surveyed areas in the Near East, there are many geographical gaps within the greater region. Potentially, more research needs to be conducted in the marginal upland areas. Because it is unlikely that only one environment (either lowland or highland), was exploited by any one group, survey needs to extend past traditional bounded units like plains or valleys, to incorporate a more holistic framework. These surveys provide the raw data upon which analysis of regional and inter-regional population dynamics are based. The methods of and problems inherent in these analyses as drawn from the survey data will be discussed in detail in the following chapter.

4 Concepts and Approaches

4.1 Population Trends

The term 'population trends' implies spatial and temporal changes in population levels over time; however, arriving at an accurate and complete estimation of a region's total population based on archaeological information is difficult. In using the term population trends, I am therefore referring to the growth and decline of human groups as inferred from an analysis of settlement trends, namely aggregate occupied site area per period and total number of sites per period. In taking a long-term approach to population and settlement dynamics, I hope to produce an analysis that will overcome minute variations and present a robust long-term overview. This approach is one of many that have been employed to examine growth and decline of human populations in the archaeological record. However, in some cases estimating actual population numbers involves making assumptions with spurious accuracy, and data manipulation that may alter the raw data too much to be useful in a cross regional comparison.

Perhaps it is useful to discuss the application of population estimates on several analytical levels, and a certain level of accuracy could be seen to accompany each level. First, there is the estimation of the population at site level at any one point in time. Second, would be establishing an estimate of site population through time. The third level would involve an analysis of a regional trend through time. Finally, one can aim to produce a credible comparison of interregional population dynamics. These levels represent different qualities of data that are increasingly further from the source. This is a way of emphasizing the variability that will be present in an interregional analysis. As one moves successively farther from site level at a single point in time to encompass a wider region over a long period of time, the probability of getting a correct estimate decreases. Each of these analytical levels will undoubtedly have issues associated with making population estimates, which will be explored below. Any population estimate is a static approximation, unable to represent the growth and decline that was realistically occurring. Instead, it captures a single point in the settlement history of a site or region. Therefore, as we try to construct regional population trends over extended periods of time, the margin of error increases, and the resolution of the information decreases. The variables affecting this last plane of analysis are far greater than at the first level. Thus, it seems appropriate to view interregional populations over time in terms of the gross trends they produce, with a focus on robust observations. Perhaps it is with this view in mind that this study can be framed.

At site level, dwelling space coupled with an estimation of people per household can be employed to arrive at a population figure for an urban centre. However, there are many variables involved in analysis that can produce such a wide range of estimates as to limit its usability. Ethnographic data, while being anachronistic, provides interesting comparative material for the recoverable archaeological population changes (Kramer 1982; Sumner 1979, 1989). Historical evidence in the form of census data, parish records and other documentation is widely used to supplement archaeological evidence (Chamberlain 2006; Hassan 1981; Smith 1999) but is obviously lacking for the prehistoric periods. Cemetery data, and paleopatheological studies can also prove useful in such an endeavour (Chamberlain 2006: 81-126; Hassan 1981: 83; Schacht 1981: 121-22). However, compiling these levels of data for entire regions without making blanket assumptions and in a format that is comparable with other regions is a huge task that would require many projects working in conjunction, with guidelines to a sort of 'best practice' being followed. Avoiding the application of actual population estimates, that is people per hectare, and sticking to more robust variables may allow one to stay closer to the root data, which is going to be the most accurate for comparison as it has not been so wholly manipulated. On the other hand, the broad approach ignores issues of settlement contemporaneity and growth and decline within a period. These issues will be discussed in detail below.

4.1.1 Survey data and population estimates

Interpretation of settlement data to make observations about regional and site population trends has been attempted in many ways (for review see Hassan 1981). In the previous chapter many facets of regional survey methodology as it has been applied in southwest Iran and the Near East were discussed. Cultural taphonomic processes and geomorphological factors affect the recoverable settlement patterns upon which regional population observations are made. Sampling problems cannot be avoided and one cannot assume to ever have a complete representation of all the sites from any one given time (Schacht 1984). However it is necessary to examine several issues directly involved in the translation of survey data to population estimates, or observations of gross population trends.

Because of their more robust nature, large multi-occupation sites are much more likely to survive in the archaeological record than low-level or temporary sites, which can greatly affect a regional population estimate. This is less problematic for viewing population dynamics in the long term, but hampers the application of a settlement density for the region. The questionable nature of any estimates for the earliest occupations in multi-period sites is also problematic (Kouchoukos & Hole 2003; Neely & Wright 1994; Wilkinson 2003a). Because early sites are more likely to be obscured by later occupation, any population curves constructed with regards to early periods will indicate a small population and rise substantially in subsequent periods. The relationship between prehistoric sherd recovery and later occupation on a single site has shown the poor survival of prehistoric elements in continuously occupied sites (Cherry et al. 1991; Sbonias 1999a: 4).

Population studies have traditionally made use of site area as defined by surface artefact scatter (Adams 1965). However, arriving at a reliable estimate of site size per period from survey can also be problematic. The probability of the entire area of a multi-component site being representative of each chronological component is unlikely. Dividing area into size categories (i.e. less than 1 ha, 1-5 ha, etc.) and assigning an average settled area for that category is a reasonable way of dealing with this problem. However, incorrect estimation of site size per period is more problematic for analysis of hierarchical relationships between settlements than a broad regional population estimate (Sumner 1990a: 4).

In discussing the use of survey data in demography, Sbonias notes: "A problem with surveys though is the degree of direct relationship between settlement pattern and demographic events. Generally, in the middle and long term, there seems to exist a quite straightforward relationship between a population growing and declining and the number and size of sites observed in the landscape" (Sbonias 1999b: 232). This should be kept in mind when reviewing the more fine-grained or absolute ways of estimating populations; we cannot really get at population trends without any spurious accuracy. However we can look at these broad trends in comparison with more qualitative data in an attempt to characterize overall patterns in the long term.

As another method of crosscheck on population estimates and settlement trends, it may prove beneficial to compare settlement trends with historical data when it exists. Steinkeller (2007) has recently demonstrated this application with textual evidence from Ur III Umma compared to settlement data obtained from surface survey (see Adams 1981) in an attempt to better illustrate the relationship between the rural and urban sectors. He argues for a higher than previously thought number of (very) small rural settlements. However, despite arriving at population figures higher than those obtained from surface survey, the textual evidence generally supports the (surface survey) settlement pattern. The variation in total population is not so great as to be theoretically unexplainable through an incomplete archaeological record, population fluctuation within family structure, varying population densities and differing interpretations of rural settlements.

4.1.2 Site contemporaneity

As indicated the simplest way of translating survey data into population approximations is to assume a relationship between population and settlement area by assigning aggregate occupied area per period. This is a useful long-range approximation of the amount of sites settled during any one chronological period. However, implicit in this method is the assumption that all settlements within that period are contemporaneous and that settlement appeared at the beginning of the period and ended with the close of that period. Short ceramic phases, in which we could assume contemporaneity would be ideal. However, many ceramic periods are lengthy enough (several hundred years) to cast doubt on this assumption. A static portrait of settlement in each phase occurs with an instantaneous transition from one pattern to the next, with no trace of the dynamics involved over time (Dewar 1991: 605; Schacht 1984: 679). This problem has been noted by many archaeologists and has been thoroughly debated in many works on population dynamics in southwest Iran and beyond (Dewar 1991; Schacht 1981, 1984; Sumner 1990a; Weiss 1977).

Wright's and Johnson's (1975) study of early state formations in southwest Iran dealt with population as a variable in the urbanization process. They presented population trends as aggregate site data per period, not unaware of the 'double counting' issue, as they termed it. However, they felt that this problem was mitigated by relatively short ceramic periods (*ibid.*: 274). Their underlying assumption was that the relationship between settled area and population would give them a base approximation of broad population dynamics; however, their assigned period lengths were erroneous, as noted by Weiss (1977).

Standardization of total site area per period by unit of time has been suggested to counteract the effects of 'double-counting' (Schacht 1984; Weiss 1977). However, standardization does not come without its own issues. It still assumes the instantaneous nature of site settlement and abandonment, and that all sites have an equal probability of being occupied at any one time (Sumner 1990a; Weiss 1977: 96). Schacht (1984: 679-80) also points out that standardization can serve to reverse apparent growth trends, a very unsettling prospect. Sumner (1990a) however, demonstrates that standardization on the Kur River Basin data does not in fact always reverse trends, but serves to dampen peaks in population apparent in un-standardized data. Standardization addresses chronological issues but creates "an unrealistic model of settlement growth and decline" (Schacht 1984: 679). Schacht's (*ibid.*) alternative statistical model, which he applies to the Susiana plain for the second millennium, helps to address the issue of contemporaneity in a way more representative of reality, but still with its inherent problems. Adams (1981) also recognized the issue of settlement contemporaneity and expressed concerns over the application of standardization on imperfect data. Noting the probability of diminishing apparent population densities, he expressed a preference for a "less rigorous approach" until these issues can be better dealt with (*ibid.*: 51).

More recently Dewar (1991) has devised a very useful method of determining settlement and abandonment rates and, through this, simulated averages of the total number of sites occupied at any one time within a region. The average time a village was in use during that period can also be calculated. This method has been used to analyze data from both the Susiana (Kouchoukos 1998) and Deh Luran (Kouchoukos

1998; Neely & Wright 1994) plains with very positive results. Despite its undoubted usefulness in establishing finer trends, Dewar's method does not indicate which settlements were occupied simultaneously.

I would argue that even with more sophisticated simulations like Dewar's there are pitfalls. It is true that in assigning population densities, this type of model eliminates the tendency to make very high estimates of regional population. However there is still a lot to be said for observing gross trends, - that is aggregate occupied area per period - when expressions of long-term change are desired. In general, all population estimates must be subject to scrutiny and doubt, and there is still need to be cautious of minute fluctuations. Wilkinson (2003a: 44) has suggested that the broad trends observable in these curves should be countered against more qualitative data, which is sometimes neglected in favour of actual population estimates.

4.1.3 Estimating Population Size – persons per hectare

Within Near Eastern archaeology the application of population densities ranging from 100 – 200 persons per ha to site area are relatively common. These densities are attested by ethnographic data (Adams 1965: 24; Johnson 1973: 66; Kramer 1980; Sumner 1989). However, the use of a "magic number" applied across the board would deny the variability that may exist between settlements and regions, and it may help to apply a range of densities to express this possible variation (Wilkinson 2003a: 41). These absolute population estimates suffer from the same sampling variability, site survival issues, and general problems that are involved with the collection and recording of survey data.

Population densities can also be derived for settlements by an assumed relationship between population and habitation space. The application of Naroll's (1962) ethnographically derived constant of $10m^2$ of dwelling space per person, is commonly cited. Other studies of modern villages in southwest Iran have indicated an average of 8-10 m^2 per person (Kramer 1982; Sumner 1989). However, there are many variables that will affect a blanket application of household population densities; room function is not always apparent in the archaeological record, and multi-purpose rooms are hard to identify. Estimations of households within structures based on hearths, ovens and storage space are not always reflective of the current family composition, and it must be realized that not all houses of a certain period were simultaneously occupied (Kramer 1982:119). Family structure and size will vary greatly over time, and therefore there may be great diversity in the number of household inhabitants even within a relatively short period. Various factors can affect family composition including whether it contains extended family, the number of births, deaths, and marriages. Agricultural communities seem to fall in the range of three to seven people in the household at any one time, with an average of five (Chamberlain 2006: 52).

Within a settlement there may also be varying densities; i.e. older quarters may be more crowded. Interestingly, Adams (1965: 24) noted a density of between 34.7 and 330 people per ha between seventy different old quarters in Baghdad, which seems to imply that there is no rule of thumb when assigning densities even within settlements. Postgate's (1994) estimates of the urban population of Abu Salabikh shows an amazing range of variability. He extrapolates the density of a sample area of residential settlement onto the entire site applying a range of densities from 4 to 7 m^2 per person. The end result is that he supposes a population of between 248 and 1205 ha per person, a rather high and wide-ranging estimate. How useful this range is, is questionable.

Taking site-based estimates to the regional level is also problematic. Site size is not always indicative of site function, and therefore without knowledge of this function it is difficult to determine the density of a settlement (Kramer 1982: 175). Schacht (1981: 129-131) suggested the use of a variable density model to determine a set of relationships between living space and population density for different site sizes (functions within a regional hierarchy). There is no standard relationship that is valid between sites and a regional estimate would have to be constructed by piecing together individual settlement population estimates. A variation of Schacht's model was used to account for density variation in small and large sites in the Kur River Basin, but found little variability between the two, and an average density was used for analysis (Sumner 1989).

There is some evidence however, that unreliable population estimates at site level tend to even themselves out at the regional level. De Roche (1983) devised a method of population estimation using modern data from settlements in Mexico. Actual census data provided cross-checks for the estimates made. While at site level the margin of error was between thirty and forty percent, at the regional level the estimates were only off by ten percent or less. As well, the study pointed out that while application of a blanket density at site level produced a margin of error, regionally it appeared apt. Therefore, while it might not be possible to reliably estimate population levels at site level, they may balance each other out in a regional study.

The key issue to take away from a discussion on assigning population densities and making absolute estimates is variability. There is arguably no more uniformity in these estimates as there is accuracy in constructing population curves based on total site area. In general, these estimations provide us with quantitative assumptions but lack the qualitative associations that would perhaps make them more robust. As a comparative tool, ethnographic and historic studies of population and settlement composition are invaluable.

4.1.4 Networks, movement and cross-regional population trends

In order to describe the dynamics of a population it is important to first understand what is meant by this term. A population is, in its most obvious sense a group of individuals linked by several factors. Avoiding biological definitions, a suitable description of population is "a social unit in which individuals are linked by their common linguistic, cultural or historical experience" (Chamberlain 2006: 1). In a way, this study is also assuming that populations can be defined by a geographical unit, which could be a valley or plain that seems to contain a homogenous 'culture'. However, we can never hope to fully understand how a past society defined themselves as a cultural group, and therefore caution should be taken in making assumptions. Equally, we can recognize that "in ancient and modern times a shared material-cultural assemblage reflects some degree of cultural association" (Henrickson 1994: 87). This becomes very important when trying to recognize cross-regional networks and trace the movement of people within this wider framework.

Population trends reflect the peaks and troughs of an overall population over time and are dependant on the rates of births, deaths, and migrations within that group (for a comprehensive overview of fertility and mortality rates see Chamberlain 2006: 25-38, Hassan 1981: 95-142). Overall, variation in a population or its dynamics can be explained as a consequence of fertility and mortality, but it is also highly likely that movements of people, perceptible in the archaeological recoverable settlement pattern, occurred. These populations (e.g. living within the Susiana plain) were not isolated in relation to other groups within southwest Iran (e.g. the Kur River Basin) and greater Mesopotamia. Indeed various studies have implied the movement of populations within Mesopotamia, and the influx of people into the southwest Iranian heartland during the Uruk period (Adams 1981; Algaze 2004; Pollock 2001). These 'bounded' units are also arguably fluid when considered part of the larger continuum of subsistence strategies practiced within the Near East, the two ends of this spectrum being fully sedentary and fully nomadic. There has to be a consideration of, if not means of identifying the various component parts of a population in order to fully understand it and to make any guess as to its actual size.

Adams (1966: 58-59) first discussed the idea of population feedback in regards to the interdependence of those engaged in nomadic and sedentary subsistence strategies. Nomadic groups who have fallen on hard times may have to seek work as agricultural labourers, whilst thriving nomads may convert pastoral wealth into the more permanent commodity of land:

> "There is additional reason for considering the adaptive patterns characteristic of Mesopotamia as regional in scope rather than as centering upon an individual sedentary community. Mesopotamian herdsmen and farmers, or rural folk and city dwellers, for the most part have never been fully stable types but a shifting continuum...a population among most of whom settled city life was continuously viewed as merely one of several available options" (*ibid.*: 59-60).

As noted above, population dynamics can be measured in the number of births, deaths and migrations. Focusing on migrations, perhaps as much in space as along a continuum of shifting subsistence, reveals possible intricate connections and networks of trade, transhumance and seasonal movement. Sparse settlement patterns and inferred population declines could be indicative of both out-migration and a decline in *sedentary* population. Ethnographic literature on the movement of mobile pastoralists communities is well developed in southwest Iran and provides informative comparative data for the study of such networks and movement (see Barth 1965; Beck 1986; Zagarell 1982).

4.1.5 Population pressure, carrying capacity, and land-use intensification

One of the most controversial debates that stem from the study of population dynamics in archaeology is the issue of population pressure as a causal factor in socio-cultural change, following the work of Boserup (1965). Since then there has been much debate about the causative role of population growth in processes such as early state formation and urbanization in southwest Iran (Smith & Young 1972, 1983; Weiss 1977). Wright and Johnson's (1975) analysis of the Susiana plain populations noted population decline at the crucial stage of state formation, which was subsequently countered by Weiss (1977), who reassigned period lengths and presented population growth during this stage. However, a reanalysis of all the available Village period pottery collections from the Susiana plain has indicated a correlation between population decline and early state formation processes (Kouchoukos 1998; Kouchoukos & Hole 2003). Thus, the use of different periodization and chronologies can greatly affect the interpretation of population peaks and troughs and one should use caution in associating population increases with cultural change. In general, archaeological studies have now moved away from associating socio-political complexity with population pressure. In itself, population pressure does not provide a satisfactory impetus for urbanization.

The carrying capacity of a population, which is the upper limit a population can reach and still effectively sustain itself on available resources, (Chamberlain 2006; Hassan 1981: 164) is a variable concept. Agricultural and industrial innovations have allowed human populations to lift their carrying capacity several times (see Whitmore et al. 1994). Hassan posits a relationship between carrying capacity and innovation as such: "A population at an optimum carrying capacity would have time to develop a new technology...that might ultimately lift the carrying capacity to a new level. The new socioeconomic conditions associated with the new technology may in turn promote population increase" (Hassan 1981: 172). However, land use intensification has been shown in association with peaks in population and can be seen in the form of off-site sherd scatters indicative of manuring (Wilkinson 2003a: 49).

4.1.6 Population dynamics and the environment

Agricultural systems, unlike more mobile subsistence strategies are more vulnerable to environmental change (Hassan 1981: 260). These systems require at least a semi-sedentary population, which in theory, is detectable in the archaeological record. This means we can make inferences about the effect the environment, and the human alteration of it, had on the settlement record. Comparisons of environmental data, such as pollen and oxygen isotope data from Lake Van (Lemcke & Sturm 1997; Wick et al. 2003) and Lake Zeribar (Stevens et al. 2001; van Zeist & Bottema 1977; van Zeist & Bottema 1982) can be compared with population fluctuations to observe broad environmental changes, and possible correlations. In no way does this analysis attempt to imply that human demographics are solely a response to environment and climate, and there is no reason to be so deterministic.

It is however, interesting to note human-environment interaction as another tool in a holistic analysis of settlement patterns in the long term (see Alizadeh et al. 2004). This type of analysis has been briefly demonstrated for the Kur River Basin and North Jazira with data from Lake Van (Wilkinson 2003a). Henrickson, (1994: 94) from pollen core data has indicated a possible decline in average temperature for the Zagros valleys during the Late Chalcolithic acting as part of a larger socio-economic crisis, for the emergence of nomadic pastoralism. Sumner (1986: 207) has indicated that the apparent hiatus following the Banesh phase in the Kur River Basin may be related to salinization as a consequence of irrigation, resulting in a change in subsistence strategy. Whitmore et al. (1990) have produced interesting examples of human-environment interaction and its apparent effect on long-term population trends in the Tigris-Euphrates lowlands. However they point out the “complexity” of these interactions and caution against “the danger of invoking simple, direct correlations between fluctuations in population and environmental transformations, and the need for caution in using population as a simple surrogate for environmental transformation. Nevertheless, it is interesting to note that [when] population patterns exhibit decreased stability, both radical and cumulative, environmental transformations persist” (*ibid.*: 37). While the influence of environmental factors and human responses on these events is debatable, long-term population dynamics do benefit from a comparison with environmental data.

4.2 Methodology

> "Only when genuine comparisons across long intervals of time are possible, transcending the specialized biases and limitations of particular archaeological assemblages and genres of texts, can we begin to understand why certain patterns developed cumulatively while others went in a different direction and flourished more briefly" (Adams 1981: 243).

Survey data in the most elemental format from various parts of greater southwest Iran can be used to explore the limitations of a study of comparative long-term population dynamics. A broad perspective and substantial time span allow one to look beyond slight variations and indistinct patterns that are easily lost within the noise of the data, and identify robust patterns of settlement and population growth and decline. Perhaps from that point, suggestions could be made about networks and movement of people in the archaeological record. Primarily, one must question the validity of cross-regional comparison on different sets of data collected and manipulated by different projects, without standards that would facilitate similarity. Various methods of standardization have been reviewed and critiqued in the previous section, and it must be kept in mind that once data has been manipulated it may be too far removed from its raw state to facilitate comparison. There must be a way of establishing the most elemental form of data that can be reliably compared across the board. The use of aggregate occupied area per period, and total number of sites per period will be used to contrast regional development. Many approximations of population dynamics have previously been made and these approximations, if possible, will be coalesced and synthesized into a comparable format.

4.2.1 Criteria for inclusion in analysis

In order to ascertain the relationship between the population dynamics of the highlands and lowlands of southwest Iran, two surveyed regions from each area were chosen. The Susiana and Deh Luran plains of Khuzistan are representative of lowland alluvial regions, while the Kur River Basin of Fars and the Islamabad plain in the Central Zagros chain are representative of highland valleys and plains. A further lowland study region, the Ram Hormuz plain, was added for comparison to the trends on the Susiana plain, because it became apparent that the disparate nature of the Susiana data may prove problematic. While these datasets will be the focus for the primary analysis, other relevant areas in southwest Iran and greater Mesopotamia will be used for comparison. The differing geography, environment and subsequent resource disparities give the greater southwest Iranian region its dichotomous nature, with two varied landscapes ripe for comparison. The lowland alluvial plains lend themselves to agricultural practices, while the Zagros piedmont and foothills lend themselves to a more mobile lifestyle based on herding, interspersed with agriculturally productive valleys. The various natural environments therefore promote a continuum upon which the two extremes are sedentism and nomadism, which are not wholly independent modes of subsistence. It is also important to note that both highland and lowland landscapes would have been utilized by mobile groups on a seasonal basis.

Geographical placement of the study areas in relation to one another is also important. The central Zagros highlands (in which the Islamabad plain is located) and the Khuzestan plain (Susiana and Deh Luran) are in a proximity to each other to enable the movement of people and goods between them. More importantly they form an area that hypothetically could be used as the summer and winter grazing areas for transhumant pastoralists. The Kur River Basin an the Susiana plain are also in a position for comparison because of the historical and archaeological evidence of their interaction, especially after the establishment of large urban centres at Susa and Anshan (Carter & Stolper 1984; Miroschedji 2003).

The history of survey in these regions has been discussed previously (see Chapter 3) and will not be repeated here in great detail. The Susiana plain is one of the most frequently surveyed regions in the Near East, and therefore a prime choice for a study of this nature. The population dynamics of Susiana from various periods have been studied in varying degrees of detail over the years (see Kouchoukos & Hole 2003; Miroschedji 2003; Wright & Johnson 1975 for examples). The adjacent Deh Luran plain also provides some of the most detailed information on the population dynamics of a lowland environment (Kouchoukos 1998; Neely & Wright 1994). The Kur River Basin is possibly the best known highland region in southwest Iran, and has been surveyed with a view to understanding settlement patterns and population trends several times (see Alden 1979; Sumner 1972). The Islamabad plain was more recently surveyed, and is also well published. The focus of much of the study is the development of mobile pastoralism in the Zagros and therefore also gives another perspective through which to view regional populations. Overall the primary datasets were chosen from regions that were subjected to a relatively full-coverage regional survey with a broad range of periods in mind. The subsequent material was also well published and easily accessible, with access to the original site catalogue preferred but not always gained. Estimation of occupied area for each period at each site, or at least an indication of the total area occupied during each cultural phase was also of prime importance.

4.2.2 Scale

Population dynamics can be viewed on many different scales, from global to site based. Global population models such as the logarithmic-logistic model which argue for the increased carrying capacity of the world through three revolutions (tool, agricultural, and industrial) are useful in establishing very long-range approximations, but mask over variation that would occur at a regional level (Whitmore et al. 1990: 25). Such a global view however, is not realistic when considering the time-period under analysis. Taking a regional approach does not mask the variability that is involved in these overarching trends, and indeed "the reconstructions for previous eras strongly suggest asynchronous regional variability in population trends, including the possibility of significant regional population declines" (*ibid.* 27). Indeed, it is the identification of these proposed disparities in spatial dynamics that are the goal of this study. Archaeological studies have often favoured regional analysis (as discussed in chapter 3), and have even taken population dynamics down to the site level. On the other end of the spectrum to global population patterns, site based estimates are often pursued and absolute (yet sometimes still highly variable) population estimations are made (see Postgate 1994).

An analysis of regional population trends over the *longue durée* will hopefully produce a more resilient pattern, while staying within the context of a loosely socio-culturally defined area. Braudel (1972) has described the various scales of historical analysis, of which, the most relevant is the long-term. In long-term history the focus is on structure rather than events, which he denotes as examples of the relationship between human groups and the environment and a "history of constant repetition" (*ibid.*: 20-21). For example, Miroschedji (2003) has argued for the cyclical nature of power shifts over several millennia from Susa to the highlands based on long-term population dynamics. It is within this framework of gross trends at a regional level that this analysis will be undertaken

4.2.3 Chronologies

The construction of a comparative chronology of the four study regions raises various problems. We need to be able to compare regional chronologies in order to establish synchronous or asynchronous population trends. However, regional sequences are regularly established independent of their neighbours and all too frequently independent of parallel work in the same region (compare Alizadeh 1992; Dollfus 1985; Hole 1985). Comparative chronologies have attempted to parallel developments in adjacent regions based on ceramic similarities. The question then becomes whether or not one can truly compare data dependent on chronologies, not chronological data. In the course of this research it became apparent that variations in the chronological sequence could affect the outcome of the analysis. If applying the same techniques to two or more different periodizations for the same region produced a similar outcome then one could argue a general robustness for the data. That is, if overall variations of a few hundred years do not greatly affect the over-arching patterns apparent in the long-term population dynamics, then the pattern is robust. Therefore, it became necessary to test the sensitivity of the data to chronological variation. Variations in the timing of certain periods, and suggested parallels with other regional ceramic traditions are all presented so as to provide different possibilities. This approach would reiterate the argument about the general reliability of gross trends, even if they are not the most elegant. However, in general the gross trends stand up to variation. In the end, this analysis will not only be trying to establish if there are complementary population trends based on aggregate occupied area per period within southwest Iran, but at what level of analysis these trends can be most reliably compared.

Therefore, the most up-to-date sequence for each study area has been used. The Susiana and Deh Luran sequence is based on Kouchoukos's (1998) absolute chronology of the village period, Wright and Rupley's (2001) analysis of radiocarbon dates for the Uruk period, and comparative material from Neely and Wright (1994), and Alden (1987). The Ram Hormuz plain sequence is adapted from Wright and Carter (2003) and placed within the framework developed by Kouchoukos for the village period. The Kur River Basin sequence is based on two different chronologies and periodizations. I will be discussing the Kur River Basin sequence as defined by Sumner (1994; 2003) in comparison with a further period breakdown and new radiocarbon dates published by Alizadeh (2006) , and how this affects comparison to other regions. The Islamabad plain sequence follows Abdi (2002), and is broken down by local ceramic phases and overarching period designations (i.e. Early Chalcolithic, Middle Chalcolithic, etc.). There is little agreement on the exact timing of supposedly synchronous periods between the highland and lowland regions. Therefore, I have chosen to present data for each region following the published chronologies. By doing this, it is hoped that discrepancies can be pinpointed and alternatives discussed.

4.2.4 Methods for Analysis

Aggregate occupied area per period, while not being as fine-grained as methods that distribute the total settled population more realistically and approximate growth and decline, is more robust for cross-regional comparison. The total number of sites per period for each region will also be compiled, as aggregate occupied area on its own can be misleading as to the structure of the settlement pattern. The total number of sites per period provides an index of settlement activity and the structural characteristics of a settlement pattern can be better read with an approximation of both variables. While periodization will vary from region to region, generalized statements can be made about trends occurring at roughly the same time. Standardizing data by century, whilst eliminating this problem, would present problems of its own as discussed earlier in this chapter. The subsequent data will be presented in various comparisons. The lowland areas of Susiana, Deh Luran and Ram Hormuz will be regarded individually and as a group, and the same treatment will be given to the highland regions. The highland and lowland trends will be presented against each other, as these trends are integral to this study. Furthermore, all of the observed trends will be compared to known population dynamics from greater Mesopotamia.

Hopefully, the spatial dynamics of these sequences will therefore become apparent and observations can be made about synchronous and asynchronous growth and decline in southwest Iran and greater Mesopotamia. The results of this analysis are presented in chapters five and six.

Methods such as Dewar's (1991), while incredibly useful for approximating regional patterns, are not without their problems when viewed as a tool for cross-regional analysis. The outcome of any 'Dewarized' data set could be considered tertiary; the site is surveyed, the ceramics recovered applied to a chronological sequence and the results analyzed through Dewar's method, then compared to another data set which has had the same process applied to it. It should be asked whether a comparison can be made on two such sets of information that are progressively farther from the raw data. As well, any analysis that assigns population densities runs the risk of making spurious assumptions about the population size of any area. A reliable approximate of the average number of people per household, the amount of roofed habitation space per person and the number of houses in each settlement must all be obtained through excavation and ethnographic study. In order to facilitate comparison based on survey data between regions, the same sort of criteria in assigning these variables should be used; however, this is rarely the case with estimates (albeit usually, but not always falling within the 100 – 200 persons per hectare range) being applied at the discretion of the surveyor, making it impossible to reliably compare the dynamics apparent between two different regions.

Another task of this analysis has been to review and synthesize several other major population curves already published. In some cases there were several published curves from the same regions; however, the variables used to present such data are different to each publication. It was therefore possible to compare dynamics based on aggregate occupied area to each other, and data put through the Dewar methodology with similar data (aware of the variability that was used to create each and every one of these models). In this way, one will again be able to see the resilience of certain trends, and the affect different periodization, chronology and variables have on general trends.

In order to bring each regional data set into a comparable format I employed the following method. The chronological scale was divided into two hundred year periods. Each date was assigned the number of aggregate occupied hectares corresponding to the phase that that date fell into. A shorter span of time seemed to lengthen already long periods, and a longer time scale masked the variation that was occurring in periods spanning less than that time period. Therefore, I appreciate that by doing this only the grossest trends are approximated and I may be failing to illustrate the growth and decline that probably existed within the phase. However, presenting the data at a resolution of 200 years appeared optimum for viewing the major trends.

These observations made through the above comparisons will be considered in light of more qualitative information such as: the distribution of material culture, which can indicate networks and movement; ethnographic literature that can give interesting perspectives on mobile groups who so rarely leave direct traces; environmental data; and the effect that urbanization had on the distribution of sedentary and mobile populations. Without a doubt, greater accuracy in estimating population trends is highly desired. However, because of the nature of the archaeologically recoverable settlement pattern, the detail one hopes for is not always apparent. It must be remembered that approximations made through more fine-grained approaches are still just approximations. Hopefully by investigating gross trends over a substantial time span, robust patterns will emerge, within which we can strive for more accuracy in future research.

5 Regional Population Trends in Southwest Iran

This chapter will compare long-term population trends from the survey areas discussed above. Where available the data has been compiled from the survey catalogues and presented in a spreadsheet in the appendix. These data have then been converted to graphs indicating aggregate occupied hectares per period and the total number of sites occupied in each period. Where disparities in the chronology of a single region exist, both interpretations will be presented. In the case of the Susiana plain several separate analyses will be presented, because a single site catalogue for the entire region is not available. Any manipulation of the data from the source will be indicated. Where possible the data has been presented as it was by the surveyors. Initially each region will be seen as a separate case study. From this point a comparison can occur between the lowland data sets, and the highland datasets. Eventually each analysis will be brought together into a comparison of all the data sets representing different regions within southwest Iran.

Population and aggregate occupied area curves that have already been published (Kouchoukos 1998; Miroschedji 2003; Neely and Wright 1994) will also be analyzed and where possible turned into a format that is comparable with other data. For example, two population curves from the Deh Luran plain constructed by different authors using the Dewar method have been compared in an effort to critique the use of standardization in a comparative study. The aggregate site area curves for the Susiana and Kur River Basin by Miroschedji (2003) have also been presented, and compared with the curves that I have constructed from the most basic data available. It is often difficult to find common ground on which to make comparisons of published analyses of population trends because they frequently use different scales and methodologies, and are very rarely conceived with a view to incorporating them into an interregional framework. This is a clear example of the complexities involved in this level of analysis. As discussed in the previous chapter, there is a decrease in the resolution of the data as one moves towards interregional comparison based on disparate, and often manipulated data sets.

5.1 The Susiana Plain

Due to the nature of the data from the Susiana plain, a coherent and continuous picture of settlement trends is difficult to construct. A discussion of the long-term population trends in Susiana, therefore involves a discussion of the history of archaeological survey in the region, and the agendas and research goals that framed various projects. The plain has been surveyed a number of times by different teams, with many using different systems of periodization. Each of these surveys, as discussed in Chapter 3, have their own agenda, with many of them falling into the category of 'period specific' or 'problem oriented'. It can be suggested that a narrow focus can take away from the gross patterns of growth and decline that are apparent in the *longue dureé*. It is difficult to assess the settlement dynamics of a region when they are presented as a collection of snapshots without the long-term context. These issues became problematic when trying to build a picture of the population trends that occurred from the beginning of the Village period (Early Susiana – Late Susiana) to the end of the Susa III period (Early Dynastic II).

Another key issue to consider when comparing survey data is the issue of sampling. Each survey is, of course, a sample of the total number of sites that have survived. As well, each survey consists of only a portion of the total number of sites that once existed. No two surveys use the exact same sites in their sample. That is not to say that there is no cohesion in the survey results. On the contrary, several people have attempted to synthesize the corpus of Susiana material or view its settlement over the *longue dureé,* and their data will prove priceless to this analysis (Kouchoukos 1998; Miroschedji 1990, 2003). This debate also circles back to the issue of full-coverage versus sample survey, and the consequent data. In a study such as this it can be argued that there is high value in referring back to the methodology of surveyors like Adams (1962; 1965; 1981). In these surveys while the resolution for individual periods is not very high, *the pattern of change is thought to be significant.* The inability to describe the processes through which a population appears to have arrived at a peak or a trough limits our knowledge. The Kur River Basin survey (Sumner 1972) is another good example in which a cohesive survey has provided an index of the long-term population dynamics and subsequent surveys have added more period-specific resolution.

5.1.1 Settlement data for the Susiana plain

Nicholas Kouchoukos (1998) compiled a database of all the surveyed Susiana sites of the prehistoric periods, with the notable exception of Robert Wenke's 1975 survey. Unfortunately, while the results of his analysis are available, the original database remains unpublished and inaccessible. His restudy included all of the Susiana plain ceramic collections of the Village period[1] from survey available to him in the United States and Europe. Kouchoukos also revised the absolute chronology for the Village period portion of Susiana plain sequence, which will be followed in this study. A truly detailed analysis of Susiana population trends awaits the compilation of all the survey material in existence. Until that can occur (if ever), it must suffice to analyze parts of the larger whole. Robert Wenke's survey (cataloguing well over 1000 sites) could change our interpretation of the population trends. As discussed, there are various periodizations of the Village period, and the terminologies are different for each one. Whenever possible the terminology for the Susiana sequence as laid out by Alizadeh (1992), following Delougaz and Kantor's (1996) sequence established at Chogha Mish will be used. This chronology lays out the Village Period in terms of Early, Middle and Late Susiana with appropriate subdivisions. Where needed the alternative phase names will also be given for clarity. (See Fig. 5.1 for the comparative chronology of the Susiana and Deh Luran Plains.)

[1] The "Village period" is defined by Frank Hole (1987) as a term for the time frame roughly between 8000 – 4000 BCE, encompassing the first sedentary Neolithic villages to the end of the Terminal Susa A period.

Years (BCE)	Susiana Plain	Deh Luran Plain
2600		
	Late Susa III	Early Dynastic II
2800		
	Middle Susa III	Early Dynastic I
3000		
	Early Susa III	Jemdet Nasr
3200		
3400	Late Uruk	Late Uruk
3600		
	Middle Uruk	Middle Uruk
3800		
	Early Uruk	Early Uruk
4000	Terminal Susa A	
4200	Late Susiana 2 (Susa A)	Suse
4400		
4600		
	Late Susiana 1 (Susiana d)	Farukh
4800		
5000		
	Middle Susiana 3 (Susiana c)	Bayat
5200		
5400		
	Middle Susiana 2 (Susiana b)	Mehmeh
5600		
	Middle Susiana 1 (Susiana b)	Khazineh
5800		
6000	Early Susiana (Susiana a)	Sabz

Fig. 5.1: Comparative chronology of the Susiana and Deh Luran plains (After Kouchoukos 1999; Wright and Rupley 2003; Alden 1987; Neely and Wright 1994).

In trying to establish the aggregate occupied hectares per period and the total number of sites per period various sources are used. Nicholas Kouchoukos's (1998) restudy provides the main source of data on the Village period. Abbas Alizadeh's (1992) study of the Gremliza collection and Frank Hole's (1987a; 1987b) data are also integral to the discussion of the Susiana plain in the Prehistoric periods. Gregory Johnson's (1973) survey provides the needed information for the Terminal Susa A through Late Uruk periods and John Alden's (1987) survey was the starting point for information on the Susa III period. The purpose of this study is not to reinvent the wheel by compiling a database of all these surveys as that is well beyond the scope of this work. The most basic data that can be gleaned from these publications is presented and compared. Each period specific survey is presented in a graph indicating the relevant data. Then, they are combined to approximate a rough curve that could be compared to other parts of southwest Iran. The resultant curve should not be taken as an absolute indication of population on the plain based on aggregate occupied area. Instead the shape of the curve and the major trends (whether they be increases or decreases in aggregate occupied area) should be viewed in relation to the shape of other regional curves.

5.1.2 Period-specific surveys of the Susiana Plain

The Village Period

The earliest portion of any aggregate site area curve should be viewed with a critical eye. Site survival and burial of earlier sites under later sites is problematic when trying to reconstruct the settlement pattern for the earliest occupation on a multi-component site. This has been dramatically illustrated for the Susiana plain (Kouchoukos 1998; Kouchoukos & Hole 2003). Geomorphological studies of the plain have revealed that the majority of known Village period sites (c. 6000 – 3900 BCE) are on old alluvium, and that a supposed 30% more sites could hypothetically be located under the more newly deposited alluvium (Kouchoukos and Hole 2003: 58). Equally troublesome is the burial of earlier sites under later occupation, a phenomenon common to the ubiquitous tell site in the Near East. Therefore, the reconstruction of population trends of the early Village period or any chronologically equivalent period should be approached with caution, as they will almost always reveal a rising trend. With this caveat in mind, I have chosen to include general observations about settlement beginning in the Early Susiana (Susiana a) phase on the Susiana Plain or Sabz phase on the Deh Luran plain. However, the settlement data published by Kouchoukos (1998) only begins with the Middle Susiana 1 (Susiana b) phase, so a detailed analysis of settlement and population trends can only commence in this phase.

Using a sample of 139 sites from a larger body of at least 264 sites (Kouchoukos and Hole 2003: 58), Kouchoukos placed each site into a settlement size hierarchy, and then analyzed it using Dewar's methodology approximating growth and decline, finally assigning an estimate of one hundred people per hectare to create his published population curve (Kouchoukos 1998: fig. 3.13a). There are several issues inherent in his treatment of this data. First, a gross application of a standard density is misleading, as has been demonstrated in the previous chapter. Second, while the Dewar method can approximate the number of sites occupied at any given time it cannot tell us which ones. This also means that the most elemental form of the data was unavailable, so that the Village Period portion of the final curve is of a different resolution than the later trends. How this affects comparison will be discussed later on.

Kouchoukos's (1998) work has been adapted in the following way: the aggregate occupied hectares and total number of sites were given at each of three points (called t1, t1.5 and t2 by Kouchoukos) assigned for each period (see Fig. 5.2). These were then used to construct a graph indicating these two variables for each period. T1 indicates the beginning of the phase, t1.5 any point in that phase, and t2 the end of the phase. It is with full awareness that this data is used, even though it is not in the most basic form. The total number of sites given at each point in a period, and the assignation of the aggregate occupied hectares may be incorrect as they have been normalized. With this in mind, the following observations can be made: maximum settled area was reached in the Middle Susiana 3 (Susiana c) period, declined, then rose again slightly in the Late Susiana 1 phase (Susiana d). The Susa A appears to be a time of population decline resulting in a lower settled area in the Early Uruk period.

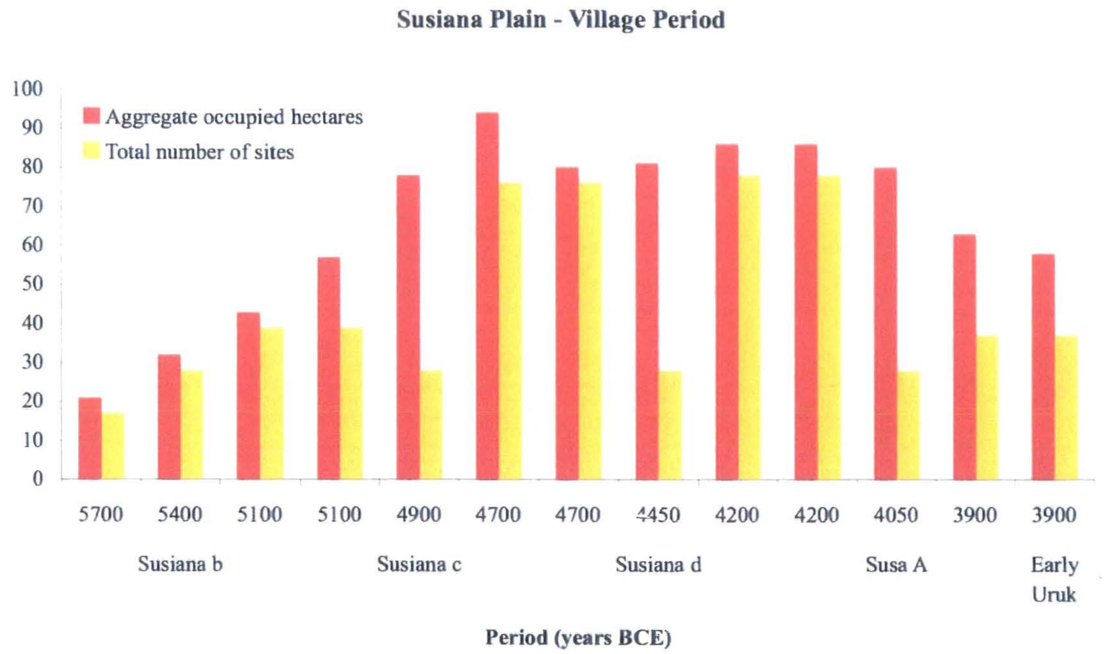

Fig. 5.2: Village period population trends on the Susiana plain based on aggregate occupied area (data from Kouchoukos 1998: Table 3.8).

In order to incorporate these data into a curve for the entire Susiana plain sequence Kouchoukos's data were dealt with in the following way. His method gave an estimate of the number of aggregate occupied hectares at the end of one period and the beginning of the next, both corresponding to the same point in time. He then assigned a population density of 100 persons per hectare to each point. Then to reach his final population estimate for that point in time he 'smoothed' the population estimate. This consisted of averaging the number of people at the end of one period and the beginning of the next to arrive at a figure for that point in time. The same principle has been applied here, but instead of assigning actual population densities, I have simply averaged the aggregate occupied hectares at the end of one period and the beginning of the next to arrive at an the average or smoothed number of hectares for that single point in time. The results are presented below in Fig. 5.3. The same trends are apparent, but I have simply eliminated two separate hectare estimates for the same time point. I am wary, however, of how close this approximation is to the raw data and will treat it with caution because of its manipulation by both Kouchoukos and myself.

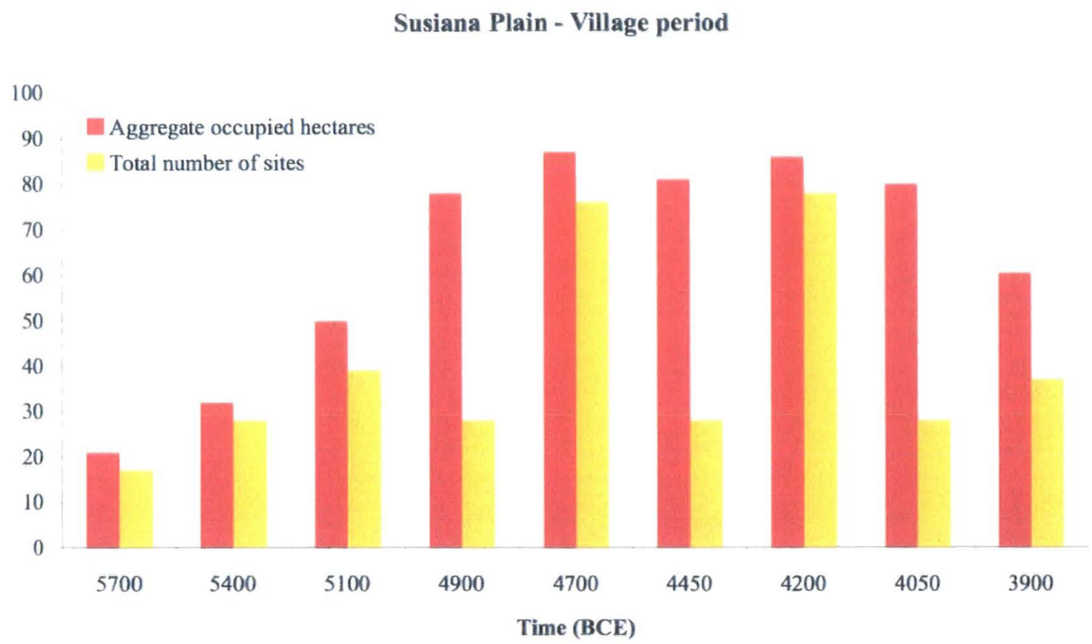

Fig. 5.3 Village period population trends on the Susiana Plain smoothed (data from Kouchoukos 1998; Table 3.8).

In 'smoothing' the data and eliminating two different estimates of the aggregate occupied hectares for the same point in time, the peak in the Middle Susiana 3 period is dampened. Therefore, the total aggregate occupied hectares appear to decline slightly afterward and then return to the Middle Susiana 3 peak by the beginning of the next period (Late Susiana 1 or Susiana d). However, it is also very likely that this slight decrease in settled area would not be present at all in any of the raw data, and is in fact a product of the Dewar methodology. This point will be discussed shortly when these results will be compared to other graphs of the Susiana plain based on the aggregate occupied area per period.

Interestingly, when using this data to observe the aggregate occupied hectares versus the total number of sites within a phase there are some perplexing trends. The Dewar method creates anomalies in the number of settled sites within a period. This pattern does not conform to either Alizadeh's or Kouchoukos's periodization (see Fig. 5.4). In the Middle Susiana 1 and 2 (c. 5700 – 5100 BCE) the aggregate occupied area seems to rise hand in hand with the total number of occupied sites. However, in Middle Susiana 3 (c. 5100-4700 BCE), the population appears to have undergone a rising trend ending with the maximum population on the plain during the Village period. On the other hand, the data analysed using the Dewar methodology would indicate that the total number of sites decreases substantially at t1.5; that is, any point within the period. The number of occupied settlements in Middle Susiana 3 goes from 39 at t1 to 28 at t1.5 to 76 at t2. Even more dramatic is the difference between the total number of sites within the Late Susiana 1. While the area settled remains relatively stable throughout the period, site numbers would appear to be very high at the beginning and end of the period, but less than a third at any point within the period. Obviously one must question the validity of this type of standardization for comparing the aggregate occupied hectares and total number of sites. The total number of sites is generally a reliable index of settlement trends (i.e. agglomeration or dispersion), but these dynamics are somewhat puzzling. I think that this may indicate that the data produced using Dewar's algorithm cannot be used for approximations of this type and only seems to work when calculating an average population (number of people) per period. Therefore, with this data there are few observations that could be made about the number of sites in comparison to the aggregate occupied hectares of each phase that would not be spurious.

Kouchoukos (1998: 89) has pointed out that in general his periodization (numbers of sites per period) most closely matches that of Alizadeh's (1992), but is based on a much larger sample of the Susiana ceramic collections (See Fig. 5.4). Total site numbers in the Early Susiana phase are quite low (Alizadeh 1992: 56), and may be inaccurate due to burial under later occupation or geomorphic processes. A sharp increase in the number of sites between the Early Susiana (Susiana a) and the later village period occupation (Middle and Late Susiana) was recognized in early survey (Adams 1962: 112) and subsequent investigations (Hole 1987a: 40). The results of a restudy of the periodizations of the village period indicate that "it appears from raw site counts that prehistoric populations on the Susiana plain reached a maximum during the Susiana c [Middle Susiana 3] period and either declined slightly or remained more or less stable throughout the remainder of the Village period" (Kouchoukos and Hole 2003: 56). Site counts then decrease in the Susa A (Late Susiana 2) through to the beginning of the Early Uruk which supports Wright and Johnson's (1975) postulation that there was a population decline between Susa A and the Uruk period (Kouchoukos and Hole 2003: 58).

The problem with rectifying these and other published periodizations (e.g. Dollfus 1985; Hole 1985) is that each uses a different sample of sites. Alizadeh's (1992) periodization is based on pottery analysis of the Gremliza collection, which favoured painted pottery and therefore periods like the Early Susiana are not as well represented. Kouchoukos's (1998: 89) periodization, while based on a restudy of the entirety of the accessible Susiana Village period material only uses a sample of 139 of 264 village period sites. Thus, it must be recognized that even with this newest periodization there is room for error. Further study of yet unpublished collections could change our current thinking. It is quite telling that the broad trends that were first identified by Adams (1962: 112-114) still hold up: the total number of sites proliferated after the Early Susiana phase, peaked around the Middle Susiana 3 and Late Susiana 1 phases, and experienced a decline after the Later Susiana phase.

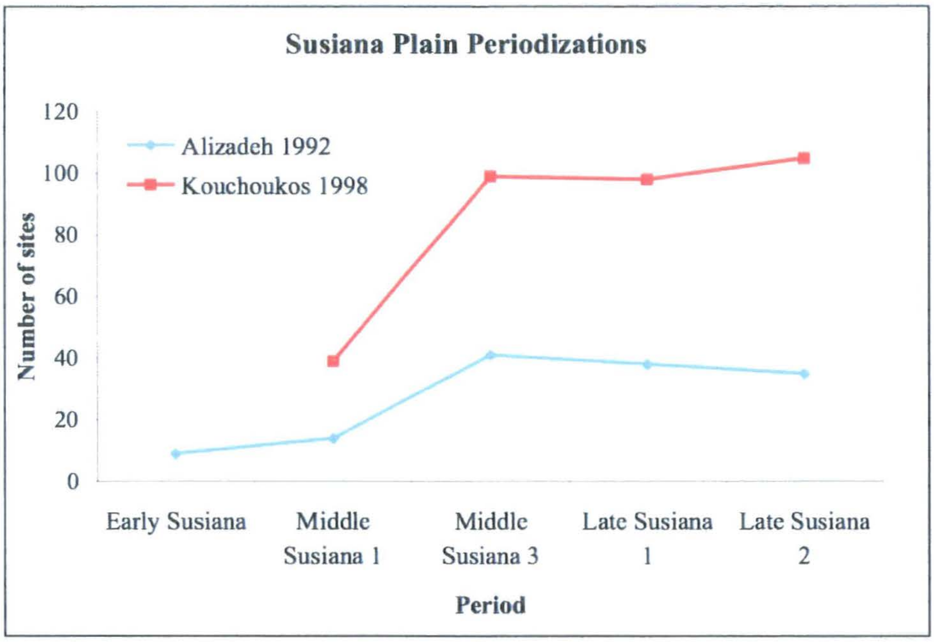

Fig. 5.4 Susiana plain periodizations (after Kouchoukos 1998: fig. 3.5 a and b).

The Uruk Period

To look at the dynamics occurring in the Uruk period on the Susiana plain, data from Johnson's (1973) survey is used. The survey sample includes 67 sites with known Uruk or Terminal Susa occupation (*ibid.*: 24-25). From this a graph was constructed of aggregate occupied hectares per period and contrasted with the total number of sites occupied (See Fig. 5.5). This is the raw data obtained from his site catalogue, with no standardization. From this the Uruk period appears to be a time of population growth. The aggregate occupied site area triples between Terminal Susa A and the Early Uruk (from 29.72 ha to 96.42 ha, respectively). The Middle Uruk period sees further growth with a total of 128.47 occupied ha. The Late Uruk period sees a decline in settled area to half that of the preceeding phase. Looking at our other variable, we see the total number of sites increases from 49 to 56 between the Early and Middle Uruk, but decreases to 14 in the Late Uruk. In general a rise in population after the Terminal Susa A through to the Middle Uruk and then a decline in the Late Uruk could be inferred. Throughout this cycle the difference between the aggregate occupied area and the total number of sites grows. This could indicate that settlements are becoming larger, even if they are becoming fewer. In fact, the site of Susa was not founded until the Susa A period, and Wright and Johnson (1975: 272-273) indicate that by the Early Uruk period we see three different site size classes; villages, small centres, and a large centre, namely Susa.

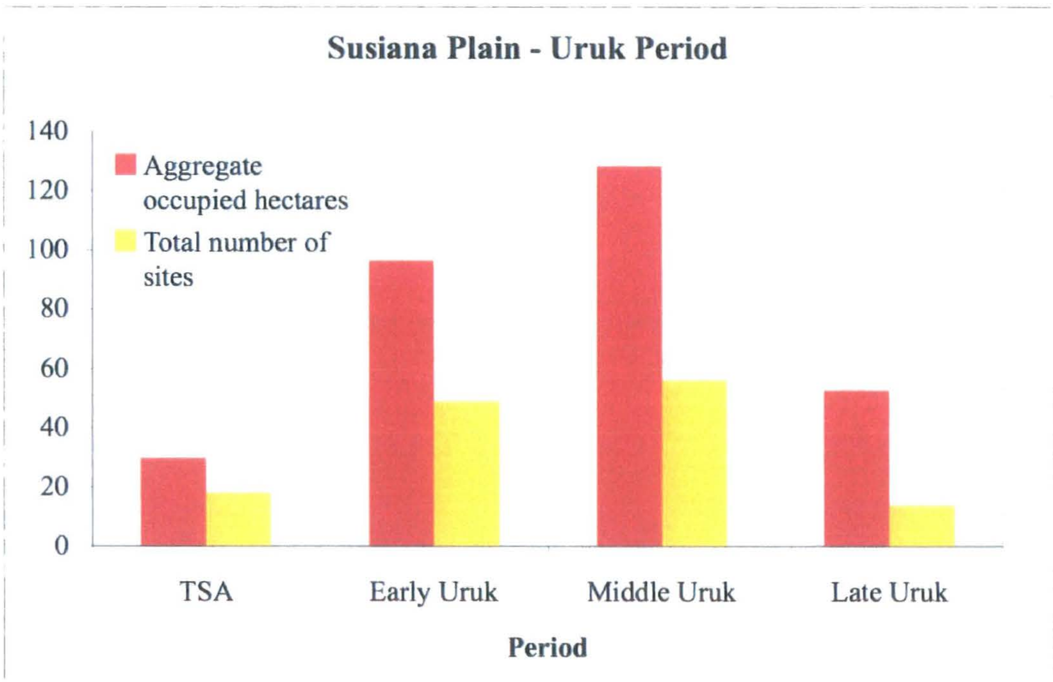

Fig. 5.5: The Susiana Plain in the Uruk period (data from Johnson 1973)

Kouchoukos's analysis (1998) of the Susa A and Early Uruk periods, overlaps with the information that can be gleaned from Johnson's survey (Terminal Susa A through Late Uruk). Therefore, the overlapping data will be discussed in order to see how closely the two data sets resemble one another. Firstly, they do not use the exact same sample of sites, and on this point they will obviously differ. Secondly, Kouchoukos's results have been produced by the Dewar method, while the picture of settlement dynamics and aggregate occupied area that is presented in Johnson's (1973) data does not take into consideration the 'contemporaneity problem' (Schacht 1984). Kouchoukos's data is based on a chronology that does not distinguish between Late Susiana 2 (Susa A) and Terminal Susa A occupation (see Kouchoukos 1998: 75 for his reasoning behind this [2]). However, he does present the aggregate occupied hectares at the beginning, any point in the middle, and the end of the Late Susiana 2 (Susa A) period. One could therefore, assume that the occupation at the end of his Late Susiana 2 (Susa A) period represents the Terminal Susa A occupation.

Johnson's survey indicates that there were very few sites, and very little aggregate occupied area in the Terminal Susa A period, but an increase in both these variables in the Early Uruk. Kouchoukos's data indicates that there also was a decline in the Late Susiana 2 (Susa A) period, but that the succeeding Early Uruk period did not rise above the total amount of settled hectares of the preceding period. Possibly, this is again a result of normalizing data. One would assume that if Kouchoukos's analysis included the t1.5 and t2 data points for the Early Uruk phase that we would most likely see growth similar to that represented in the Uruk period data of Johnson. In order to maintain, as best as possible, a continuity in the source data I have chosen to construct this portion of the curve for the Susiana plain using the available data in the following way: I felt it appropriate to finish off the Village Period sequence with the data from Kouchoukos, and then to begin the Uruk sequence with the unstandardized data from Johnson's survey. In this way I hoped to at least provide some continuity within defined overarching phases.

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[2] Kouchoukos's absolute chronology for the village period was developed in order to best handle the vast amount of information on the Susiana plain, and find the best approximation of all the different stratigraphic information from each excavation. Therefore his purpose was to "construct large unordered groups of measurements for each major archaeological phase" (1998: 75).

Susa III

The Susa III period received the most intensive scrutiny with Alden's survey (1987). In this interpretation the Susa III period sees the aggregate occupied hectares barely change throughout the entire period, showing only slight decline (see Fig. 5.6). Within the period there is only a difference on average of between 17 and 13 settled hectares. Therefore, one could say that the period was one of relatively small but stable settlement (this is meant in terms of the number of settlements; there is no implication that the length of occupation at any one site was stable). However, this interpretation is drawn from Alden's survey data, which only assigns areas (ha) for 6 sites, while he cites the existence of 32 recorded from previous survey, and 22 of those 32 from his survey (*ibid.* 159). The remaining sites are characterized by having sparse and possibly seasonal occupation, and determining the extent of occupation is difficult (*ibid.* 160). The aggregate occupied hectares presented through this data set are at odds with aggregate occupied area curves constructed by Miroschedji (2003: fig. 3.3) and Schacht (1987: fig. 45) which will be discussed below.

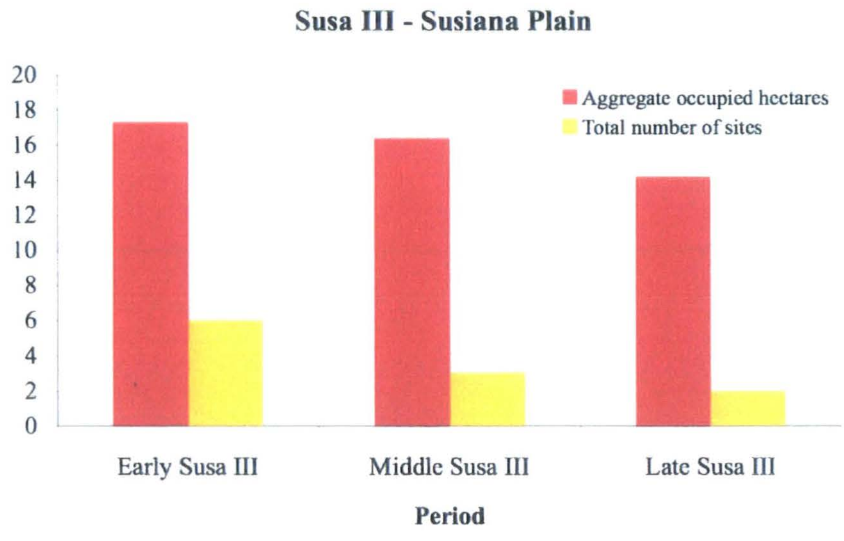


Fig. 5.6: Susa III period (data from Alden 1987: table 28)

Both Miroschedji's and Schacht's graphs indicate that the total number of occupied hectares throughout the course of the Susa III period were much higher, and both show a distinct rise in these numbers through the course of the period. By the end of the Susa III period, Miroschedji's graph indicates a total occupied area of around 100 hectares. Schacht on the other hand indicates a total occupied area of around 80 hectares. Both of these estimates are a far cry from the less than 20 total occupied hectares that Alden indicates throughout Susa III occupation. Alden's survey presents a period of low and relatively stable occupation on the plain. On the contrary, Miroschedji and Schacht's data both indicate decline and then growth through the Middle and Late Susa III periods that then continues to grow into the Early Historic periods. Because of the low site area that Alden cites in this period I have chosen to use information from Schacht (1987: fig. 45), in constructing an overall curve of long-term population trends of the Susiana plain. Alden's alternative dynamics for this period will figure in the discussion in the next chapter. Finally, the data from the rest of the second millennium, that is the Susa IV or Old Elamite period, was also taken from Schacht (1987).

5.1.3 Population trends on the Susiana Plain

Figure 5.7 demonstrates the curve that has been constructed from the data presented above. This figure was then compared to an already existing curve constructed by Miroschedji (1990; 2003) based on aggregate occupied hectares (see Figure 5.8). He has approached the study of population trends in Khuzestan and Fars in the *longue durée*. While the focus of the earlier of his two papers discussed here was generally period specific, he demonstrated that understanding the decline in the Neo-Elamite period was better put into perspective by examining the preceding and succeeding trends (Miroschedji 1990). If one compared the curve constructed by Miroschedji and Fig. 5.7, there would not agree in timing because they use different chronologies. There is also the issue of differences in source data. I was unable to ascertain the sources used by Miroschedji for the construction of his curve. Figure 5.7, constructed for this study uses several different sources. For the village period as outlined above, Kouchoukos (1998) was used. His restudy of village period ceramics included those collected by the surveys of Frank Hole, and Henry Wright, and the F.G.L. Gremliza collection at the Oriental Institute of the University of Chicago. He also attemped to use limited photographs of collections recovered by Robert Wenke's and Hassan Tala'i's surveys (*ibid.*: 86-89). For the Uruk period, I utilized Johnson (1973), and for the Susa III period Alden (1987) and Schacht (1987) were drawn upon. Therefore differences between these two curves can be seen to have two possible sources: first, different chronologies and periodization, and second, different source data.

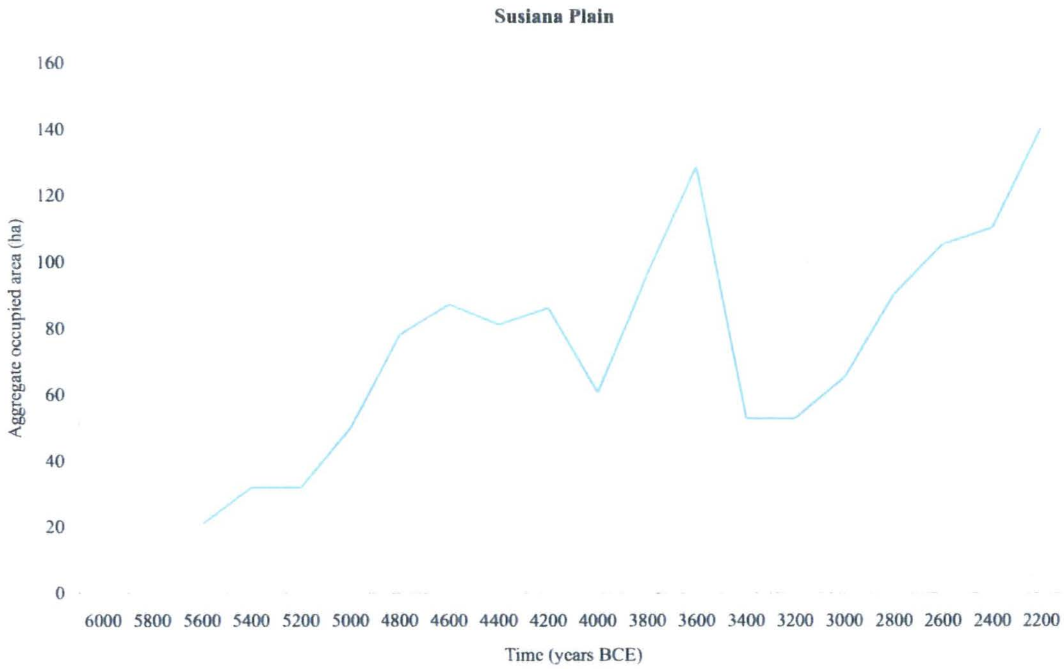


Fig. 5.7 Aggregate occupied area curve for the Susiana Plain. (Data from Kouchoukos 1998; Johnson 1973; Schacht 1987)

Figure 5.8 compares the above curve with the one constructed for the Susiana Plain by Miroschedji (2003). For the village period sequence the two curves, while showing a similar period of growth and decline do not record the exact same number of aggregate occupied hectares. The Village period section of the curve based on standardized data (Kouchoukos 1998), which *hypothetically* elicits more detail, distributes the aggregate occupied hectares across the periods more evenly. However, the curves begin to match one another more closely in the Terminal Susa A / early Uruk period, even though there is still a difference in the total number of hectares assigned for each period. Finally, there is no substantial difference in the two curves between the Early Uruk through and the end of the Susa III period. If the shape of the curve is considered most important then despite differences in the detail of the curves, the trends of population increase and decrease are remarkably similar. There is so much variability that can exist in actual estimates of regional populations (see Postgate 1994) that there is no surprise that we should find a certain amount of variability in estimates of aggregate occupied area. The variation highlights a difference in the sample of sites used for each study, the size of the site assigned to each period and the processes of standardization or normalization that the data has undergone.

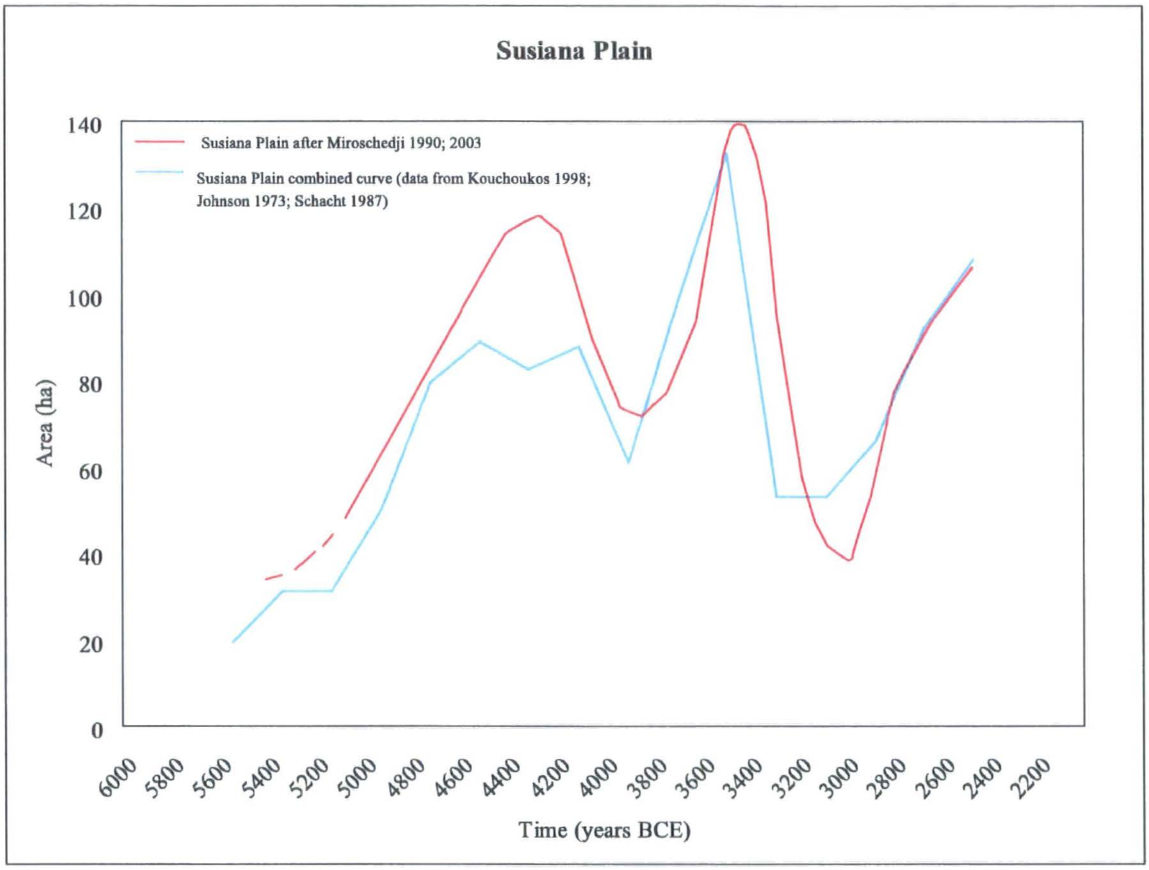


Figure 5.8. Susiana plain population trends compared to Miroschedji 2003: fig. 3.3.

Despite, an arguably robust set of long-term trends for the Susiana plain, one should consider the disparities highlighted thus far, and remain ever so slightly critical of the Susiana settlement data. Can an illustration of aggregate occupied area per period gathered from different projects, using a different sample of sites, and each with period or problem oriented agendas really prove to be a true index of settlement trends? Perhaps it is in a smaller more cohesive region that we can find a parallel to the Susiana trends that will reinforce the above findings. Therefore I will briefly look at the trends occurring on the Ram Hormuz plain.

5.2 The Ram Hormuz Plain

Because the Ram Hormuz survey data (Wright & Carter 2003) was collected in a single survey, the resultant data does not suffer all the same problems as the Susiana Plain data, and theoretically should provide the same quality of information for each phase as well as the same sample of sites. As mentioned above, the Ram Hormuz plain has been included in this analysis with the hope that it might provide a similar index of population trends that we see on the Susiana plain, therefore reinforcing the Susiana curve. Because of its location, approximately 160 km southeast of Susa and 310 km northwest of Tal-i Malyan in the Kur River Basin, there has been much speculation about its links with these early centres (*ibid.*).

Overall, the aggregate occupied area of the Ram Hormuz has always been quite low (see Fig. 5.9). During the Middle Susiana phases, it would appear that the population of the plain was especially small. There is an average of 1.6 occupied hectares, and 3.7 occupied sites within the three phases of the Middle Susiana. Wright and Carter (*ibid.*: 65) indicate their doubt in the ability of such a low population to sustain itself in this phase and suggest that it must have been part of a larger "social unit" linking it to large settlements over 80 km away in Behbehan or Hindijan-Zureh valley. While this is a possibility, one should not discount the potentiality of small agricultural populations of about 100 to sustain themselves without dying out, as has been demonstrated for the Mediterranean region (Zubrow & Robinson 1999). In addition to this, Wright and Carter seem to have neglected to consider mobile pastoralist groups in being a possible contributor to these communities. Ethnographic evidence indicates that Ram Hormuz is within the sphere of the Bakhtiari tribes migration pattern and has been an administration centre for tribal activities (Wright and Carter 2003: 62; Zagarell 1982).

The aggregate occupied area increases sharply from less than two hectares in the Middle Susiana 3 to slightly more than ten in the Late Susiana 1 phase (c. 4700-4200 BCE). This apex of settlement in the Village period sharply drops in the subsequent Late Susiana 2 (Susa A, c. 4200-4000 BCE) phase to less than four hectares. The Ram Hormuz data reinforces the decline in settled population between the Late Susiana 2 and Early Uruk phase (c. 3900-3700 BCE). A relatively small cycle of growth is observed in the Uruk phases with an almost imperceptible loss of 0.6 hectares between the Middle and Late Uruk. While on the Susiana plain the Late Uruk phase sees significant decline, the population on the Ram Hormuz plain appears to remain stable and continues into the late fourth millennium (noted as the Banesh phase by the surveyors as its associated with this phase in the Kur River Basin). The mid to late third millennium on the plain sees a lack of perceptible settled population, with a resurgence of sites equalling three hectares in the early second Millennium.

The shape of the aggregate occupied area graph constructed for the Ram Hormuz plain mimics the Susiana trends on a much smaller scale until the end of the fifth millennium. A cycle of growth and decline corresponding to the Uruk phase appears to link the Ram Hormuz more directly with the Susiana plain, and indeed this is noted from excavations at Tal-i Ghazir (Tall-e Geser) (Alizadeh 2006: 48; Johnson 1973: 46-48). It is tempting to suggest that the early state emerging in the Banesh Phase of the Kur River Basin, centred on Tal-i Malyan, is influencing settlement in the Ram Hormuz plain in the late fourth millennium. Indeed, the Ram Hormuz plain has, in historical periods often been administered by Fars or under the influence of nomadic groups from that region (Alizadeh 2006: 48). Perhaps when the Uruk cycle ends in low sedentary populations on the Susiana plain, less of an impact is felt in the Ram Hormuz because of its links to the highlands. Also, in the mid to late third millennium the Ram Hormuz appears devoid of settled population, similar to the decline in population proposed for the Kur River Basin (Sumner 1972, 1990a) (this 'hiatus'/period of low settled population will be discussed in a subsequent section in greater detail). Concurrent with this decline in the Ram Hormuz, the settled population of Susa appears to be increasing rapidly. Settled population only becomes apparent again in Ram Hormuz in the early second millennium after which site area rises dramatically in the late second millennium to twice the levels seen at the Village Period apex.

While the population trends of the Ram Hormuz plain do seem to follow along a similar trajectory to the Susiana Plain throughout the sixth and fifth millennia, it could also be argued that they generally follow a similar pattern to the Kur River Basin. Definite evidence for an Uruk period settlement is found at Tal-i Ghazir and two other sites (Wright and Carter 2003: 67), providing evidence for Susiana influence during this phase. Equally, the absence of settled population during the 3rd millennium suggests a phenomenon similar to that occurring in the Kur River Basin. Therefore, the suggestion that Ram Hormuz plain data could be used as a proxy for trends occurring on the Susiana plain is debatable. In fact, it seems quite clear that the long-term population trends of the Ram Hormuz plain are reflective of its geographical placement, and oscillating influences from both the Susiana Plain and Kur River Basin.

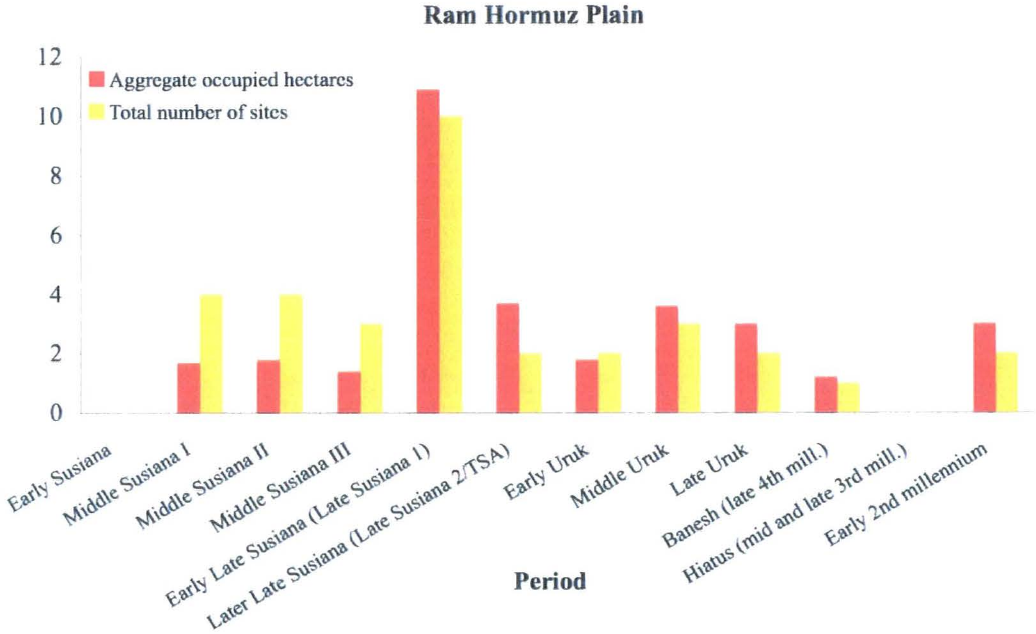


Fig. 5.9: Ram Hormuz Plain (Data from Wright and Carter 2003: 76-82).

Another interesting point comes out of a comparison of the aggregate occupied hectares and the total number of occupied sites. Previous to the Late Susiana 1 period the number of sites is almost double the number of occupied hectares, meaning that there is a significant increase in the number of small sites. As indicated before, the number of sites can be a useful index of settlement trends. Therefore, when this relationship reverses in the Late Susiana period and there appears to be an increase in aggregate occupied area in relation to the number of sites we can assume that sites are getting larger, and settlement agglomeration is occurring.

There are several points that should be reiterated in relation to the Ram Hormuz plain. Because of the very low settled area throughout the sixth through third millennia, one should be careful in using this data to define major trends. A difference of eight settled hectares between two phases seems like a significant development in this context, but in the context of the massive changes taking place on the larger Susiana plain a fluctuation of such a small magnitude could be interpreted as stability. Secondly, Wright and Carter (2003: 75) note that in 1969 when the survey was completed they only looked for noticeable mounded sites. Therefore any low-level mounds, or any more ephemeral occupations possibly representing mobile pastoral groups would not have been recorded. It is important to consider the role that the Ram Hormuz plain would have played in transhumant networks, due to its positioning at the edge of the lowland plain and on a major communication route between highland and lowland regions.

5.3 The Deh Luran Plain

Neely and Wright (1994) have written an extensive volume on the early settlement of the Deh Luran plain, with specific focus on settlement trends, population and the use of irrigation systems. The Deh Luran Plain site catalogue was utilized to create a spreadsheet of all the surveyed sites (as per Neely and Wright 1994), their site area and number. However there is some small disagreement between the amounts they assign in their settlement analysis (which is used here) and the numbers that make it into their final curve. In their attempts to get at population trends they have used densities or person per hectare estimates that they have assigned based on "architectural densities" from excavated sites of each phase. When this type of information was unavailable, parallels were drawn from succeeding and preceding periods. This was done to both traditionally derived aggregate site area estimates from survey data and simulated data produced using Dewar's methodology (*ibid.* fig. VI.1). The population estimates do provide for some very interesting patterns with which to discuss early water management systems, but the 'best reasoned guess' method used to assign densities limits the comparability of the data to that from other regions. To discuss any of the trends that appear to be occurring in the Deh Luran plain in relation to other lowland regions and the southwest Iranian landscape as a whole, the data must be brought back a step. Again we meet with the idea of varying analytical levels on which to study population dynamics. In this case I feel that assigning population densities as seemingly appropriate is rather a subjective task, as there is a lot of variation in settlement density to consider within and between settlements.

Kouchoukos (1998: table 3.9 and fig. 3.13a) also used the Dewar method to assign actual population numbers to the Deh Luran sequence in order to build a broader picture of dynamics on the Khuzestan plains, but his approach was slightly different to Neely's and Wright's. He used a blanket estimate of 100 people per ha. The chronologies used by each author differed, as did the criteria for assigning the total number of hectares per site. Kouchoukos employed site size categories, as opposed to assigning a different hectarage for each site. The results of each analysis have been plotted together (keeping to there original chronologies) to illustrate the differences. Neely and Wright's (1994: fig. VI.1) curve indicates a maximum population in the Farukh phase (equivalent to the Late Susiana 1 or Susiana d on the Susiana plain), while Kouchoukos's curve indicates a much earlier apex of population in the Mehmeh (Middle Susiana 2 or Susiana b) phase. The shapes of the two curves become very similar at the outset of the Uruk phase.

While Kouchoukos's results may be due to a better understanding of the early phases on the Deh Luran plain, the disparities between the two could also be caused by the assignation of differing population densities causing population peaks at different times. Most likely, the differences in period lengths assigned to the phases have the greatest affect where rises and falls appear. When the two chronologies are compared (see Table 5.1) Kouchoukos's period lengths are generally longer than Neely and Wright's due to the newly available radio-carbon dates that have pushed the sequence back. Clearly, this demonstrates the variability in interpretation that can be created by the use of standardization. Even when the same algorithm for approximating growth and decline of populations is applied, there are still enough discrepancies in methodologies to produce different results. Therefore, unless the same treatment is applied to each of the data sets and methodologies rigorously followed, the comparability of standardized data is questionable.

	Span (years)	
Phase	**Neely and Wright 1994**	**Kouchoukos 1998**
Sabz	150	300
Khazineh	300	200
Mehmeh	200	400
Bayat	200	400
Farukh	300	500
Suse	200	200
Early Uruk	300	100

Table 5.1 – Length (in years) of periods in the Deh Luran chronology as assigned by Neely and Wright 1994; table VI.3 and Kouchoukos 1998: table 3.3.

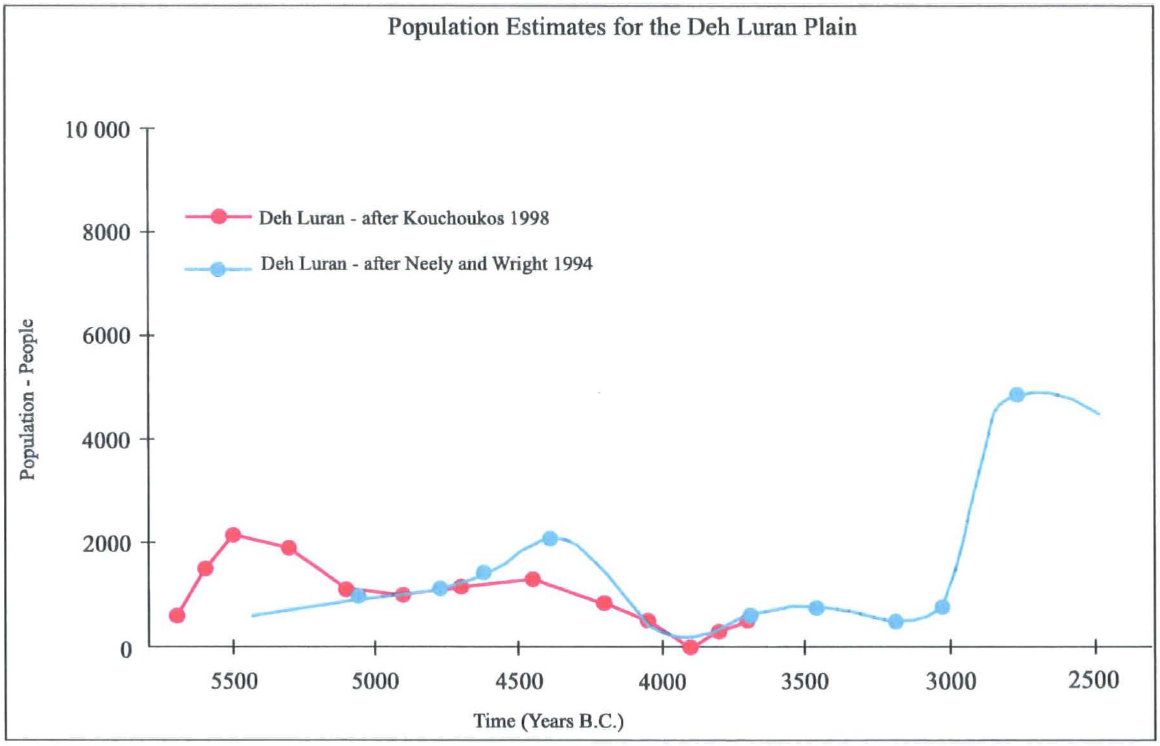


Fig. 5.10 Comparison of absolute population estimates for the Deh Luran Plain following the chronologies of the original authors (After Kouchoukos 1998: fig. 3.13a and Neely and Wright 1994: VI.1)

Unstandardized data (Neely and Wright 1994), has been utilized to construct the following figure (5.11), which indicates a dramatic increase in the number of aggregate occupied hectares between the Sabz and Khazineh phases. The aggregate occupied hectares assigned to the earliest phases should be viewed critically though, and in reality the rise in settled hectares between the Sabz and Khazineh phases may not be so dramatic. These early phases are more likely to be buried under later deposits (Neely and Wright 1994: 202). The aggregate occupied area remains relatively stable throughout the Khazineh, Mehmeh and Bayat phases. The village period culminates with an increase in the Farukh phase, and a substantial decrease in aggregate occupied hectares in the Suse phase. The Early Uruk sees the highest level of aggregate occupied hectares in the Uruk period. After this, there is a general decline through the Late Uruk. Previously unforeseen growth occurs in the Early Dynanstic I and II periods, and an immigration of people onto the plain has been postulated (*ibid.*: 178).

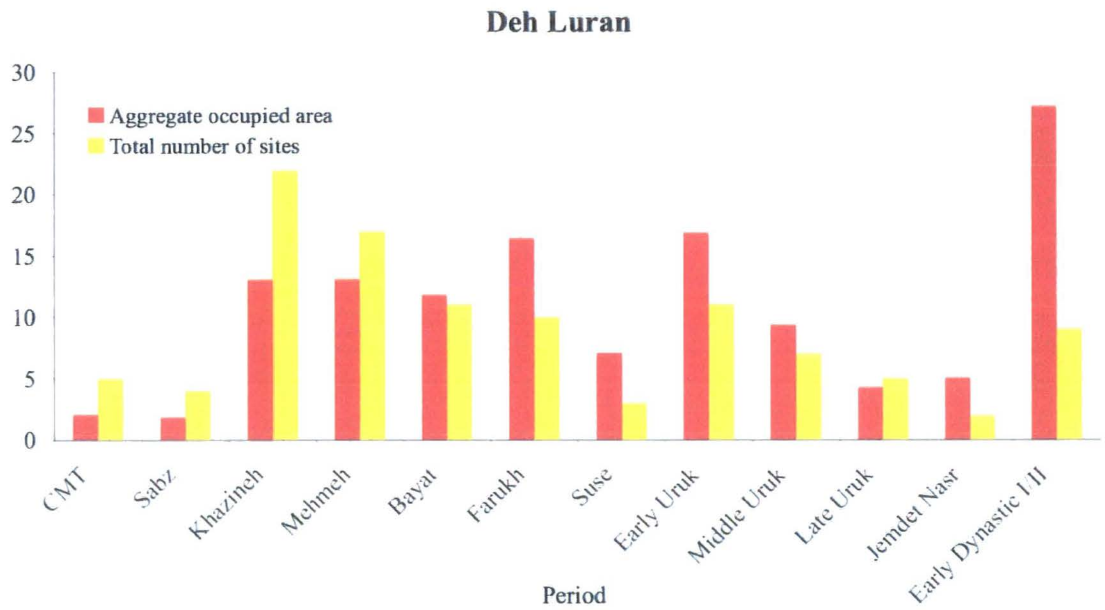


Fig. 5.11 Deh Luran (Data from Neely and Wright 1994).

Comparing the total number of sites to the aggregate occupied hectares again reveals interesting trends. One sees an apparent growth in individual site size from the Khazineh to the Bayat, with settlement being much more agglomerated in the Farukh phase. Illustrative of this trend is the settlement pattern around the large centre of Musiyan, in which most of the smaller settlements are abandoned and Musiyan itself appears to grow (*ibid.*: 171). Of course this is just a general pattern and upon closer inspection one would surely see larger settlements as well as the continued existence of small village settlements. By the Suse phase, the decline in site numbers is dramatic, a trend that is illustrated on the other lowland plains. One would assume that sites are decreasing in size in throughout the Uruk phase, but by the Early

Dynastic phases the low number of sites in comparison to the large amount of aggregate occupied hectares would indicate aggregation of populations into larger settlements.

5.4 The Kur River Basin

Surveyed extensively by Sumner (1972), the Kur River Basin remains one of the best examples of a realistic approach to full-coverage survey. The entirety of the plain has been covered with the expectation that the majority of sites have been found. Sumner's survey is also a good example of survey without period-specific focus in which sites of all periods were of interest. Subsequent surveys with more focused interest (Alden 1979; Rosenberg 2003) have supplemented this record. For this study, information on the number of aggregate occupied hectares, and total number of sites per period is derived from two different publications (Sumner 1990a: table 1; 1994: table 1, respectively). The pattern presented in Fig. 5.16 should be very familiar as it and other standardized forms of the same data have been used in many publications (Sumner 1972, 1986, 1989, 1990a, b, 1994).

5.4.1 Chronologies and Periodization

A discussion about chronology and periodization for the region needs to be undertaken before proceeding. The traditional chronology and periodization of the region is based on Sumner's survey (1972) with modifications. I will be following its newest incarnation (Sumner 2003) (see Fig. 5.12). Recently, Alizadeh (2003, 2006) has suggested an alternative sequence, particularly of the Bakun phase. When studied in the light of aggregate occupied hectares over time, Alizadeh's periodization presents a different picture of settlement and population dynamics for the region. These differences will be discussed below and assessed as to the impact that they have on the Kur River Basin's development, as well as in light of comparisons to other southwest Iranian population trends, most notably those from the Susiana plain.

Years (BCE)	Islamabad Plain (ceramic style)	Islamabad Plain	KRB (After Sumner 2003)	KRB (after Abdi 2007)
			Kaftari	
2200				
2400				
2600			Depopulation	
2800				
			Late Banesh	
3000				
				No data
3200	No data	No data		
			Late Middle Banesh	
3400			Early Middle Banesh	
			Early Banesh	
3600	Uruk Phase			Early Banesh
		Late Chalc.		
3800				
4000	Maran Phase	Late Middle Chalc.	Lapui	Proto-Banesh
4200				
4400	Siahbid Phase	Middle Chalc.		
				Late Fars / Bakun A
4600				
	BOB Phase			
4800		Early Middle Chalc.		Middle Fars II / Gap
	Dalma Phase			
5000			Bakun	
5200				Middle Fars I / Bakun B2
5400				Early Fars
5600	J Ware Assemblage			
		Early Chalc.		
5800			Jari	
6000	Gavaneh Assemblage	Late Neolithic	Mushki	Archaic Fars 2

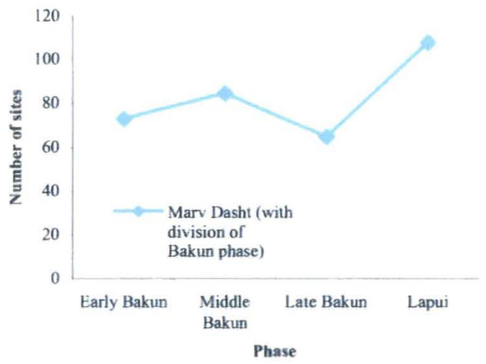
Fig 5.12 – Chronologies of the two major highland study areas in this paper. The Islamabad plain is after Abdi 2003. Islamabad Plain (1) sequence represents divisions by local ceramic phase. Islamabad Plain (2) represents divisions by non-region specific phases. The Kur River Basin (1) is after Sumner 2003 and Alden et al. 2004 and (2) Alizadeh 2007.

Sumner's (2003) chronology requires explanation on one point. The Shamsabad phase is not named or given a time frame. Instead it appears to be lumped into the Bakun phase. In an earlier publication, Sumner (1994) ends the Jari phase around 4900 BCE and assigns the Shamsabad phase a four hundred year stretch between about 4900 and 4600 BCE. In a newer publication (Sumner 2003), the Jari phase ends at about 5000 BCE and the Bakun seems to run the course of the 5th millennium. Alden et. al. (2004) have proposed adjustments to the chronology based on excavations at Kushk-e Hezar a Mushki and Jari period site. This chronology suggests that the Jari phase ends at approximately 5000 BCE, the Shamsabad then commences and runs for about 200 years ending at approximately 4800, before the Bakun begins. Therefore I will assume an approximate date of 5000-4800 for the Shamsabad phase and insert this within Sumner (2003) chronology.

5.4.2 Differing periodizations of the fifth millennium

The following diagrams demonstrate two different periodizations of the fifth millennium for the Kur River Basin. The first diagram (Fig. 5.13a) is based on data from Sumner (1994: table 1). He gives the total number of sites for each chronological phase including a gross total for the rather long Bakun phase (about 1000 years). He also presents an analysis in which he breaks the Bakun phase down into three sub-phases: Early, Middle and Late Bakun (*ibid.*: table 3). This is graphed in Table 5.13b). This breakdown was achieved in the following way; Early Bakun sites are those with Shamsabad and Bakun ceramics, Middle Bakun sites have either only Bakun ceramics or those that have Shamsabad, Bakun and Lapui ceramics, and Late Bakun sites are those with Bakun and Lapui ceramics. Those sites that have all three are not only classed as Middle Bakun but as Early and Late as well (Sumner 1994: 49). Sumner notes that there is some doubt whether or not this represents a true picture of contemporary settlement but that a finer-grained ceramic chronology is needed in order for further clarification to occur. Interestingly, there never seems to be an explicit discussion of the pattern that emerges if the total number of sites for each of these sub periods is graphed. However, as the division of the Bakun phase is still uncertain in this context, one can debate the accuracy of this interpretation. A cursory glance at Figures 5.13a and b indicates that the Lapui phase can represent either a decrease or an increase in the number of sedentary sites

a)



b)

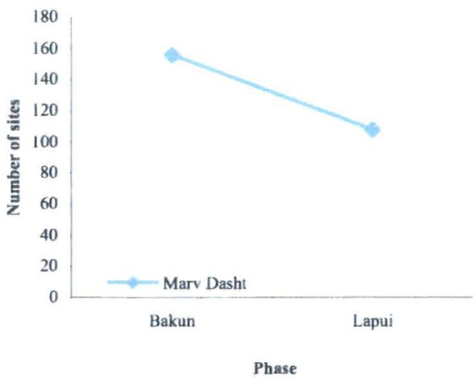


Fig. 5.13a and b: Periodizations of the fifth millennium in the Kur River Basin - data from Sumner 1994: table 3 and table 1, respectively.

The next figure (5.14) is based on Alizadeh's (2007: 49) restudy of 36 sites of the Bakun phase that were surveyed by Sumner. He has formulated his own periodization of the Bakun phase, based on distinct ceramic types, which he calls Middle Fars 1, Middle Fars 2, and Late Fars. These are not necessarily contemporary with Sumner's (1994) division of the Bakun phase. Importantly, they suggest fewer sites during each stage of the Bakun phase and produce a different interpretation of the trends occurring during that almost 1000 year period. Notably, the succeeding Lapui phase appears to have a rise in population, contrary to the population decline that is suggested without the division of the Bakun phase (Sumner 1994: table 1), but similar to the pattern suggested by Sumner (1994: table 3) but not explicitly discussed.

Alizadeh's (2003) survey of the valleys and plains northwest of the Marv Dasht plain have also been utilized to reinforce his suggestion of alternative population dynamics in Kur River Basin. Alizadeh (*ibid.*) indicates that this region is not as agriculturally productive as the Marv Dasht and traditionally is used as pasturage along the migration route of several nomadic pastoralist groups. Only the total number of sites for each period is available from the source data and while the size of each site is given in metres, there is no indication of how much aggregate occupied area was inhabited in each phase. The total number of sites throughout the Bakun and Lapui periods for Alizadeh's surveys of the Marv Dasht, and the area to the northwest of the Marv Dasht are plotted below in Figure 5.14.

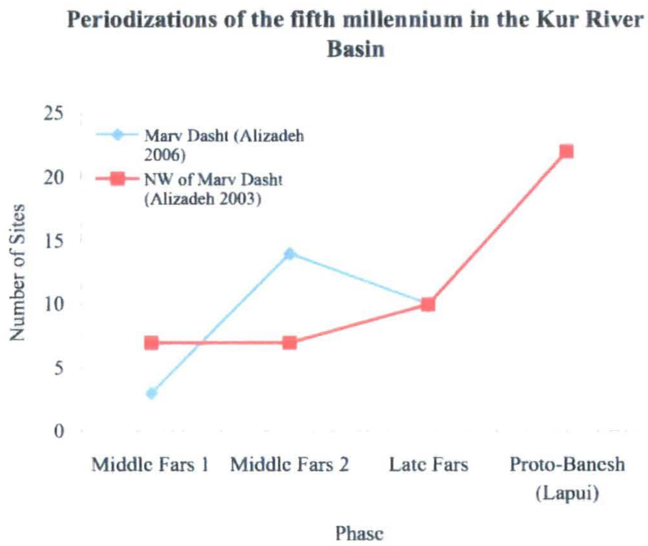


Fig. 5.14 Periodization of the Kur River Basin from (1) Alizadeh's restudy (2006), and (2) his survey northwest of the Marvdasht (2003).

There are two issues involved in reconciling Sumner's and Alizadeh's periodizations; firstly, Alizadeh's (2006) restudy of sites surveyed by Sumner only includes 36 sites and as indicated, there appears to be at least 156 sites with Bakun components (Sumner 1994). Secondly, Alizadeh's survey to the northwest of the Marv Dasht is again a completely different sample of sites. He includes several that had been previously surveyed by Sumner, as well as many that had never been recorded before. Finally, a lot of attention has been paid to the periodization of the Bakun phase because of possible interesting socio-politcal developments involving mobile pastoralist groups of the late 4th millennium (Alizadeh 2003, 2006), but little attention has focused on the succeeding Lapui phase in this context. This phase spans at least 400 or 500 years and the occupation assigned to the entirety of this phase could also suffer from contemporaneity issues. Clearly, these issues are integral to a better understanding of the regional dynamics of the Kur River Basin in the Bakun and

Lapui phases. In an interregional comparison of long-term population trends, however, this problem can neither be clarified nor overlooked. It serves to demonstrate the general instabilities, and short-term fluctuations in the southwest Iranian system that emerge at the end of the fifth and continue through the fourth millennium.

5.4.3 Population Trends in the Kur River Basin

In constructing an aggregate occupied area curve Sumner's traditional periodization has been utilized. Alternative periodizations will be considered in lesser detail in comparison to other southwest Iranian regions in the following chapter. Figure 5.15 demonstrates the population trends based on aggregate occupied area (ha) and total number of sites for each period. The data indicates a rising trend from the Mushki phase onward, culminating in the Bakun phase. After this point there is a steady decline in aggregate occupied hectares. Interestingly, in the Bakun phase, for the first time we see the aggregate occupied hectares increase beyond the total number of sites, indicating settlement agglomeration. The Lapui phase sees an increase in the number of sites in comparison to the aggregate occupied hectares indicating some sort of settlement dispersal or general reduction in the size of sites.

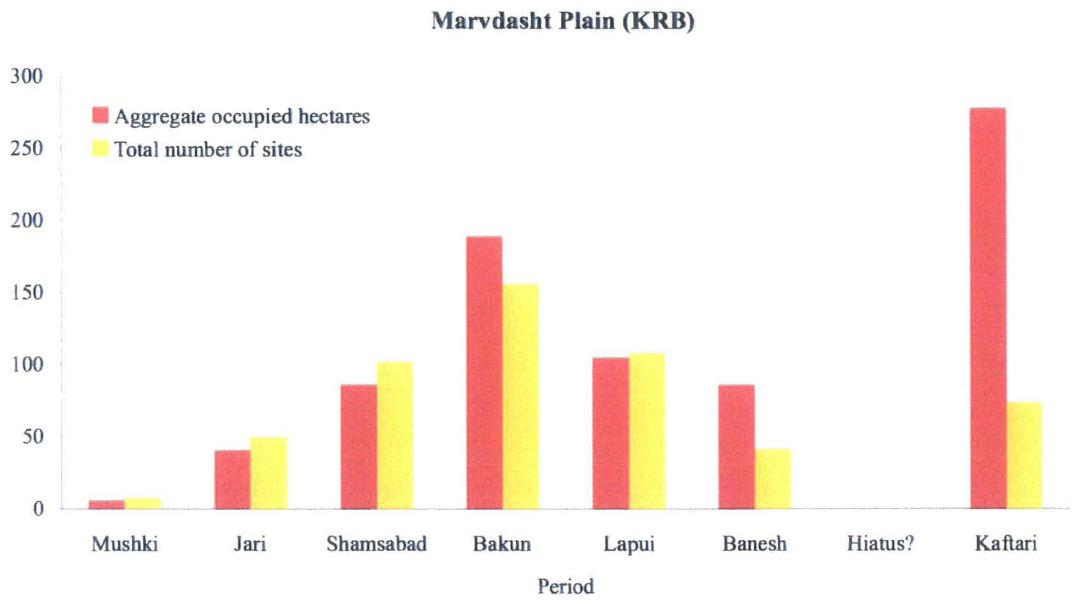
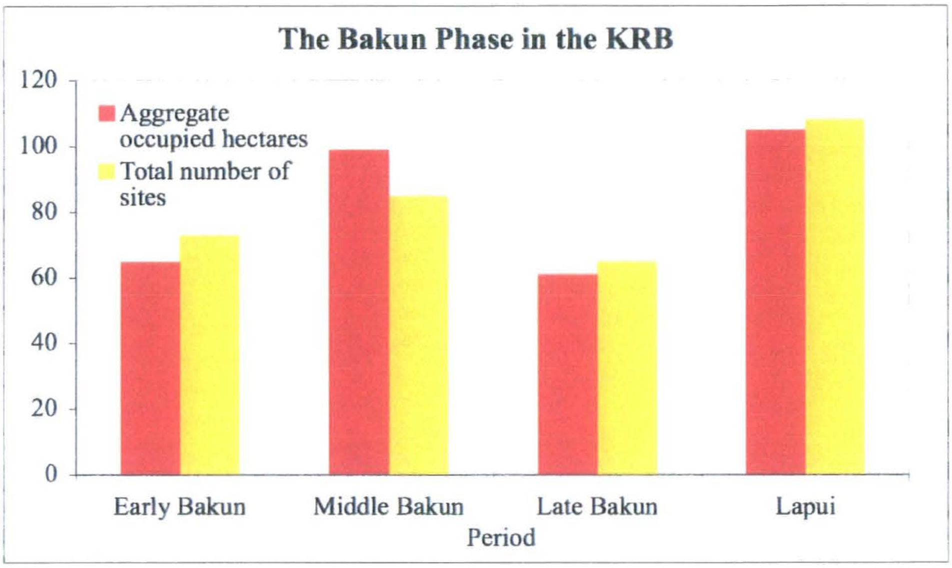


Fig 5.15 Trends in the Marvdasht after Sumner 1990a, 1994.

Different periodizations of the total number of sites per period were discussed above, and while data from Sumner (1990; 1994) was chosen for comparison with other regions, an alternative aggregate occupied ha per period analysis for the KRB in the Bakun phase is also possible (see Fig 5.16). However, as Sumner (1994) does not indicate approximate dates or period lengths it is impossible to incorporate this data into a longer curve on a chronological scale.



.Fig. 5.16: Aggregate occupied hectares and total site numbers for the Bakun phase in the Kur River Basin following alternate periodization (Sumner 1994).

Fig. 5.15 would suggest that settled population decreased between the Bakun and Lapui phase. Sumner (1986: 207) has taken this to indicate that there was a growing trend toward nomadism, especially if one takes into account his suggestion of agricultural decline due to salinization. However, when looking at figure 5.16, based on Sumner's (1994) division of the Bakun phase, the trends appear slightly differently. There appears to be a decrease in total number of sites occupied between the Middle and Late Bakun, and an increase in settled area in the Lapui phase. This periodization, as previously discussed is tenuous and may not represent the true dynamics of the region during this time. Alizadeh's (2006) periodization would seem to generally agree with this supposition in theory, and indicates that the Lapui phase represented an increase in settled population seen in the increase in the total number of occupied sites. This postulation negates a period of nomadization and instead suggests a period of sedentarization (*ibid.*).

By the Banesh phase the number of sites in comparison to the aggregate occupied hectares seems to indicate an aggregation of people in larger settlements once again, except this time on a larger scale. Excavations at Tal-i Malyan (Sumner 2003) reveal that the Banesh phase saw the growth of the first truly urban centre in southwest Iran. Subsequently, after this phase of growth we see an unprecedented decline in settlement on the plain in which little evidence for sedentary population has been found. Sumner (1990a) has equated this with a settlement 'hiatus' in the past, but more recent investigation at Tal-i Malyan have revealed small settled population at that site as well as two other sites in the Kur River Basin (Sumner 2003: 54). Even more recently, excavations at Malyan have indicated a possible cultural continuity between the Banesh and succeeding Kaftari phases retained by a very small settled population and possible interactions with more mobile groups (Miller & Sumner 2004).

The Banesh phase is another lengthy period, in which much variation in settlement could have occurred. It seemed appropriate to incorporate the published division of the phase (Sumner 2003) into the illustration of the final composite curve. The dynamics are presented below (Fig. 5.17). This breakdown indicates a cycle of growth and decline, with the maximum aggregate occupied area occurring in the Middle Banesh phase. The total number of sites decreases ever so slightly between these three phases, but in general this variable remains relatively stable. However, the low number of sites in comparison to the aggregate occupied hectares in each phase indicates an increase in large (or a large i.e. Tal-i Malyan) site.

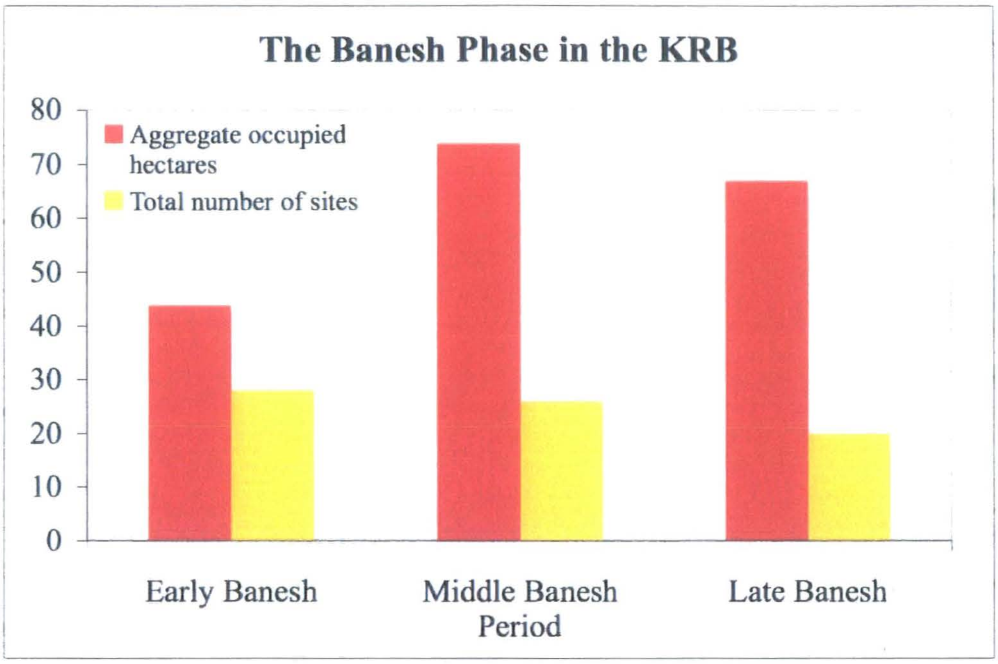


Fig. 5.17: Population Trends for the Banesh phase – alternative periodization (Sumner 1994).

Lastly, in keeping with the overall aims of this research, I have compared the curve based on Sumner's (1990a) data for the Kur River Basin to the one constructed by Miroschedji (1990, 2003). He also used Sumner (1990a) for his source data but adapted it to a different chronology. The shape of the curve on the incline suggests that longer intervals of time between each point on the graph were used, providing less resolution but a smoother result. Therefore, ignoring the time discrepancies, one could argue that these two curves are generally similar, with the only significant difference being in the Banesh phase, as a result of the use of data at a different resolution. Because Miroschedji did not resurvey the plain, there is little difference in these curves except to demonstrate the effects of different chronologies on the results.

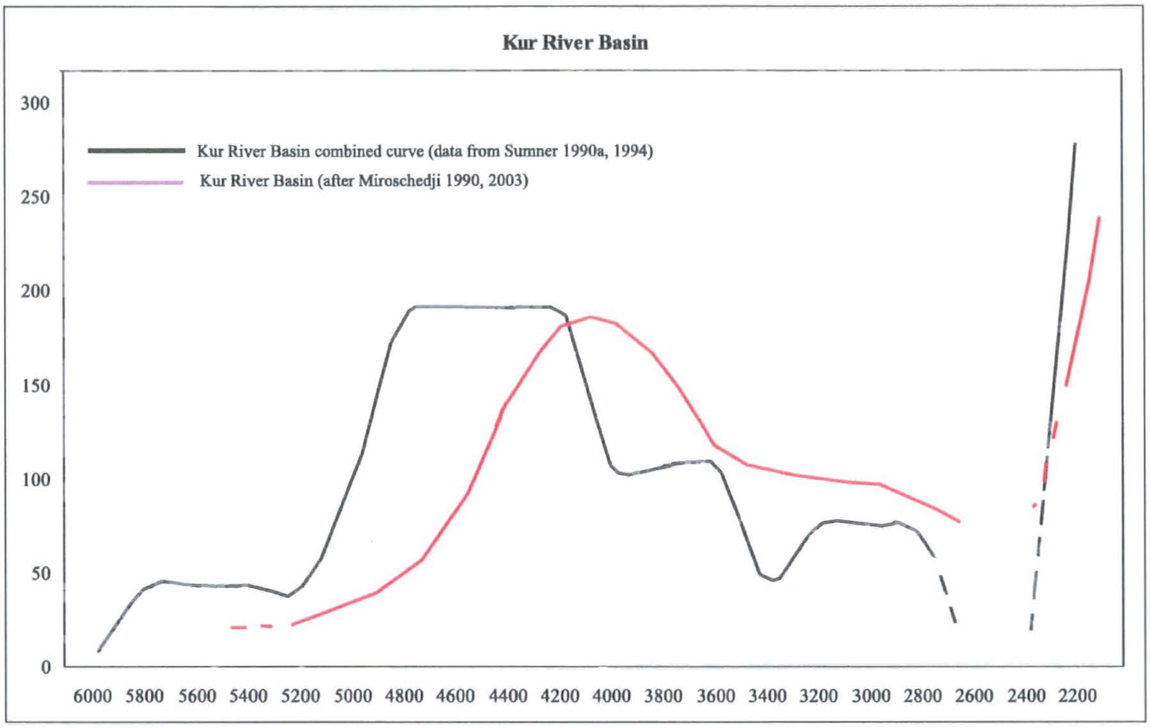


Fig 5.18: Comparison of aggregate occupied area curve of the Kur River Basin constructed for this study and similar curve after Miroschedji 2003.

5.5 The Islamabad Plain

The settlement record available for the Islamabad plain covers the Late Neolithic through Late Chalcolithic phases (c. 6000 – 3300 BCE) (see Abdi 2002, 2003). Data for later occupations have not yet been published. Therefore, interregional population dynamics involving Islamabad can only be suggested for the specified period. On the other hand, because all of the data come from a single survey, it assures the same sample of sites and does not suffer from the disparate nature of the Susiana data. Abdi (2002) divides the regional sequence into periods based on ceramic wares. However, in his analysis of settlement patterns he assigns aggregate occupied area and total number of sites for each phase based on phases following the ubiquitous period designations of the Late Neolithic through Chalcolithic.

Several of these phases (i.e. the Early Neolithic) are extremely long, spanning over a thousand years, and therefore suffer from the settlement contemporaneity issue (Dewar 1991; Schacht 1984; Weiss 1977). In these very long phases, it is questionable whether all the settlements recorded were in fact occupied at the same time. It should be kept in mind that the resolution of the data for these extremely long periods in one region may not be as clear as those for shorter periods in another region when they are compared at similar points in time. Without a more fine-grained ceramic chronology, it is impossible to make more quantitative statements, and we shall have to console ourselves with making more qualitative ones. On the other hand in an area like the Islamabad plain, which could be considered a peripheral region, population is generally lower than regions like the Susiana plain or Kur River Basin. From the late Neolithic to Late Chalcolithic settled area only ever reaches an apex of around 60 hectares. Because of the low level of settlements in general, it is more likely that many of the sites could have been occupied at the same time with a high degree of settlement continuity over a long phase.

5.5.1 Population Trends in the Islamabad Plain

Sedentary settlements seem to proliferate from the Late Neolithic, culminating in the Mid-Middle Chalcolithic (see Fig. 5.19). There is a marked increase in the total number of sites and an increase in aggregate occupied hectares in conjunction with the J-ware ceramic tradition (and its Halaf affinities from Northern Mesopotamia), which has been taken to indicate an emigration of people from north and west of the west central Zagros (Abdi 2002: 333; Abdi 2003: 418). Between the Early Chalcolithic and the Mid-Middle Chalcolithic there is an increase in the aggregate occupied area per period, while the number of sites constantly decreases. This is possibly indicative of movement from smaller to larger sites (Abdi 2003: 422). This trend signalling a growth in the size of sites is concurrent with the emergence of Chogha Gavaneh as a centre in the Early Chalcolithic (Abdi 2002:172). After the Mid-Middle Chalcolithic this growth trend takes an abrupt turn and there is a decrease in aggregate occupied area through the rest of the Middle and Late Chalcolithic, dropping precipitously in the Late Chalcolithic until there is barely any settled occupation on the plain.

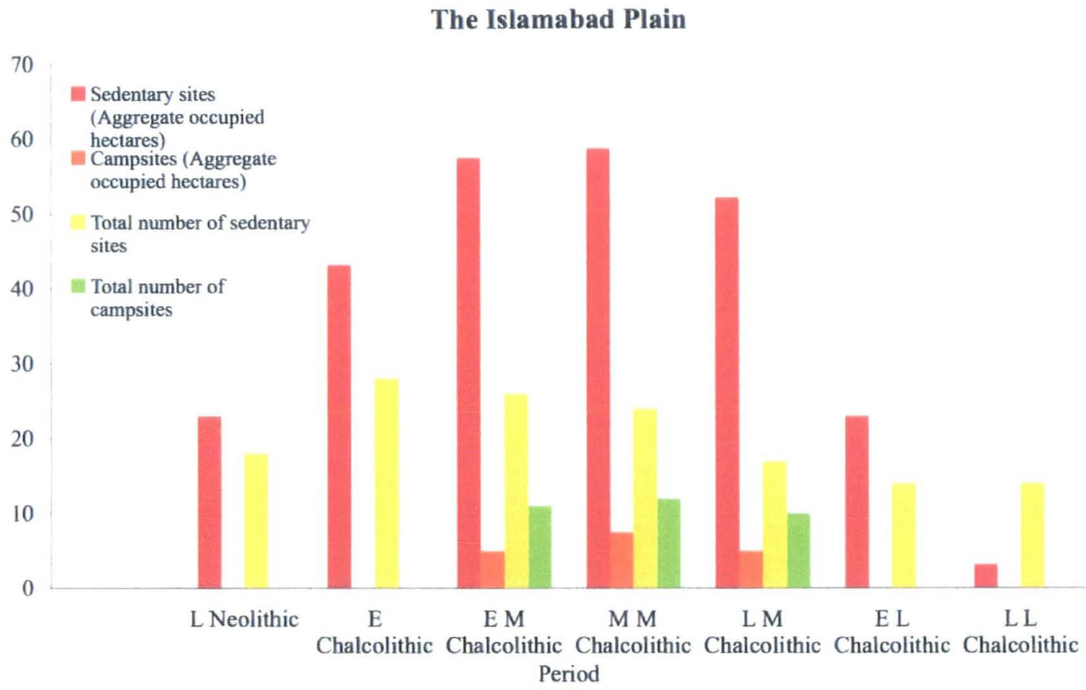


Fig. 5.19 Islamabad Plain population trends (Abdi 2003).

Unique amongst many of the surveys mentioned in this dissertation, the Islamabad plain survey includes settlement data for non-sedentary sites (those classified as campsites). Campsites become visible in the archaeological record in the Early Middle Chalcolithic, and Abdi (2003: 241) indicates that all new sites in this period are campsites. In addition, these new sites are away from the zone of cultivation but no further than five kilometres away indicating distant village based herding is occurring (*ibid.*).

When viewing the total number of sedentary sites and total number of campsites one sees an interesting trend (see Fig. 5.20). The number of sedentary sites slowly decreases from the Early Chalcolithic to the Early Late Chalcolithic. In contrast the number of campsites, first appearing in the Early Middle Chalcolithic, stay relatively steady until the Late Middle Chalcolithic. After this phase campsites cannot be identified with reliability (Abdi 2002: 179), but the total number of sedentary sites tapers off and remains steady. Abdi (*ibid.*: 181) observes : "What stands out in the Middle and Late Middle Chalcolithic is the increasing distance between sedentary villages and campsites, suggesting a gradual shift from proximate village based herding to distant village herding and to transhumant pastoralism". This is a tantalizing suggestion and will be discussed further in relation to interregional population dynamics.

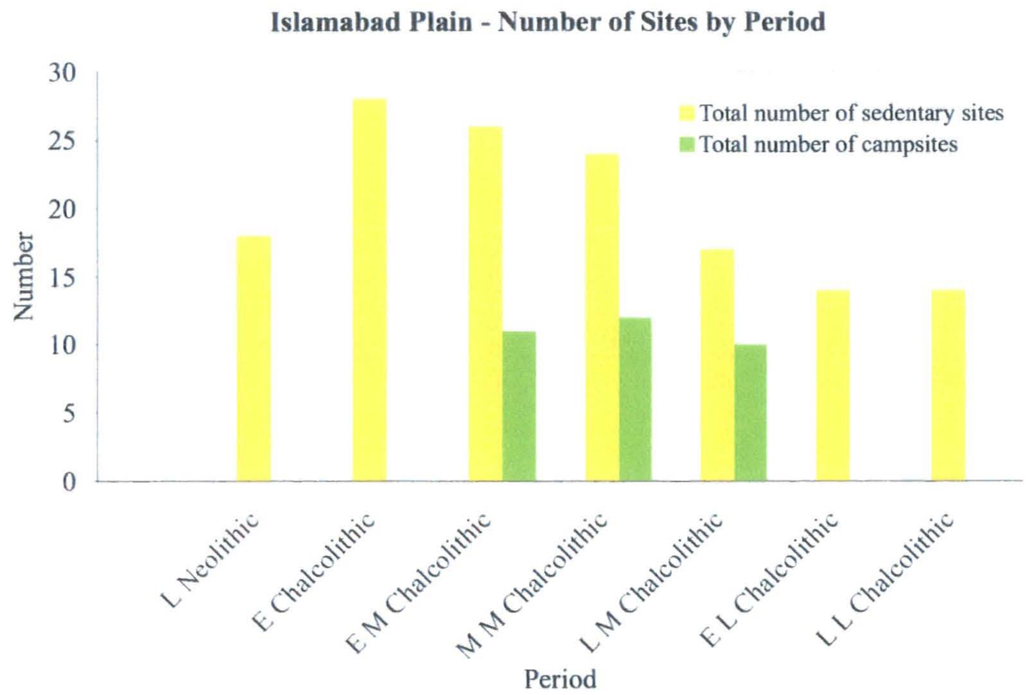


Fig 5.20: Total number of sedentary sites and campsites by period (Data from Abdi 2003).

5.6 Beyond regional dynamics

Now that each regional sequence has been discussed in its local context, one can proceed to attempt to compare and contrast at an interregional level. In the next chapter, these aggregate occupied area per period approximations will be fitted into a chronological sequence based on two hundred year intervals. In this way, each regional sequence can then be compared to the others, without being hindered with incomparable local periods of differing length. However, each curve follows the best and most current chronology, where available, but these chronologies do not necessarily agree about the time span of interregional events. Thus, the following comparison must be viewed critically. While many chronologies may agree on the comparability of events or periods between regions, they often do not agree on the timing. These discrepancies will be discussed, and hopefully not limit an interpretation of the more robust trends.

6 Comparison and Discussion

6.1 Introduction

The trends outlined for each of the regions discussed in the previous chapter will now be discussed in relation to each other and greater Mesopotamia. One of the biggest impediments, mentioned repeatedly so far, is the difference in the data resolution in each study region. Ceramic chronologies must continue to become more and more refined in order to compare regional population trends in the short-term. In the context of this study it is not possible to discuss all but the most robust trends without doubt being cast on the conclusions. Thus, observations of broad trends in the *longue durée* are focused upon.

The chronology of each region is presented as best exemplified by the surveyor or by subsequent resurvey and excavation. Discrepancies in the timing of events can be overcome by discussing generalized periods (i.e. mid to late fifth millennium. An updated comparative and absolute sequence for the entire southwest Iranian region is sorely needed. Voigt and Dyson's (1992) comparative chronology is most often cited for Iran but is based on relatively old radio-carbon dates, and new data has been recovered since. However, it does provide a good overview of comparative materials throughout the greater region. A healthy dose of scepticism is required in making comparisons based mainly on ceramic assemblages, but with little alternative this remains the best source.

In comparing regional population trends, one begins to see times when populations are truly dynamic, while patterns of relative stability also become manifest. Birth and death rates, in and out migrations, and changes in subsistence strategy all play a role in the creation of these trends. The key trends observed in this analysis will be discussed, when possible, in the context of these variables. The stability and instability of the pattern is important to this study, and in an attempt to avoid getting lost in the noise of the data, less focus is put on the timing of singular events. Instead, an attempt is made to understand processes of sedentarization, nomadization, the mobility of the population, settlement dispersal and agglomeration, and the relationship between these variables in the long-term. In this way, we may be able to identify and perhaps parallel trends across a greater distance, highlighting the problems involved in doing so along the way.

The central dichotomy that prevails in this study is that of the highlands and lowlands. Without this juxtaposition of environments the system of interaction within southwest Iranian communities and regions would be very different. The geography of southwest Iran plays an integral role in movement throughout the region and dictates the dual pattern of land use. The passages through the Zagros Mountains provide links between generally rather geographically isolated intermontane valleys/plains, and the lowland alluvial plains. In fact, there are several other related concepts which frame this study that are often cast in opposition, such as sedentary and mobile groups or central and marginal regions; these ideas are very much a construct of the natural landscape of southwest Iran. Perhaps these concepts are better cast as interactive systems than dichotomies, influenced by and influencing each component, such as movement, networks of interaction, and modes of subsistence. Equally, in understanding these interactions we must not forget the role of human action and the decisions of people and communities: "Population trends within any society are equally the result of certain environmental constraints and cultural conventions and are unique creations of the people who had to function within that environment and culture" (Young 1977: 397).

6.2 Lowland Population Trends

Comparisons between the Susiana, Deh Luran and Ram Hormuz plains are easily facilitated by a relatively new comparative chronology (Kouchoukos 1998). Therefore, it is easier to discuss spatial dynamics between regions that are not just the result of different lengths or dating of phases. Fig. 6.1 outlines the aggregate occupied area in the three lowland regions.

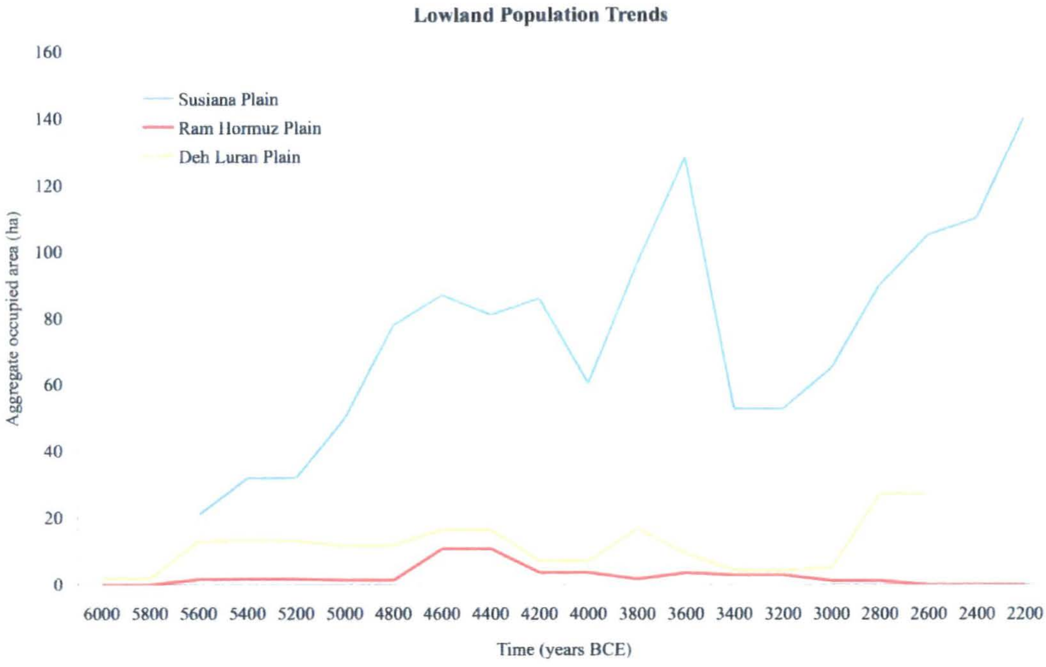


Fig 6.1 Lowland Population Trends

In general, the sixth and first half of the fifth millennium can be seen as a time of growth followed by general stability in populations, as is implied by the aggregate occupied hectares. Clearly demonstrated in the Ram Hormuz data (Wright & Carter 2003) in the Late Susiana 1 phase (Fig. 5.9), and in the Deh Luran data (Neely & Wright 1994) in the Farukh phase (Fig. 5.11), is the increase in aggregate occupied hectares coterminous with a decrease in the total number of sites indicating settlement agglomeration. Substantial increase in populations on the Susiana plain during this time could be an indication of a greater number of births over deaths, migration from other regions, or a product of an incomplete archaeological record with the earliest sites being buried under later occupation.

Besides major growth in aggregate occupied area from the Middle to Late Susiana 1 phases (c. 5700-4200) there are notable increases in this variable on several other occasions in the lowland plains: the Early and Middle Uruk phases (c. 3900-3400) and the Early Dynastic Period (c. 2900-2600). Both of these latter periods of rapid growth occur after a notable decline in population (in the Late Susiana 2/Terminal Susa A phase (c. 4200-3900) and Late Uruk phases (c. 3400-3100) respectively). These observations are most appropriate for the Susiana and Deh Luran plains as the magnitude of growth on the Ram Hormuz plain is quite minimal in comparison. The only increase in aggregate occupied area, during the periods under study, that truly stands out appears to be in the Middle to Late Susiana phases when settlement on the Ram Hormuz plain would appear to reach its apex prior to the second millennium.

The above figure (6.1) hints at an interesting correlation between the size and resources of each region and its importance to an agricultural population. The relationship between the amount of aggregate occupied hectares and the size of the survey area is relatively straightforward (see Fig. 6.2). With an increase in the size of the survey area there is an increase in the average aggregate occupied hectares for the period between 5600-2600 BCE. Data was unavailable for one or more of the study areas prior to 5600 BCE and after 2600 BCE and a reliable estimate could not be made. The relationship between these two variables is plotted below.

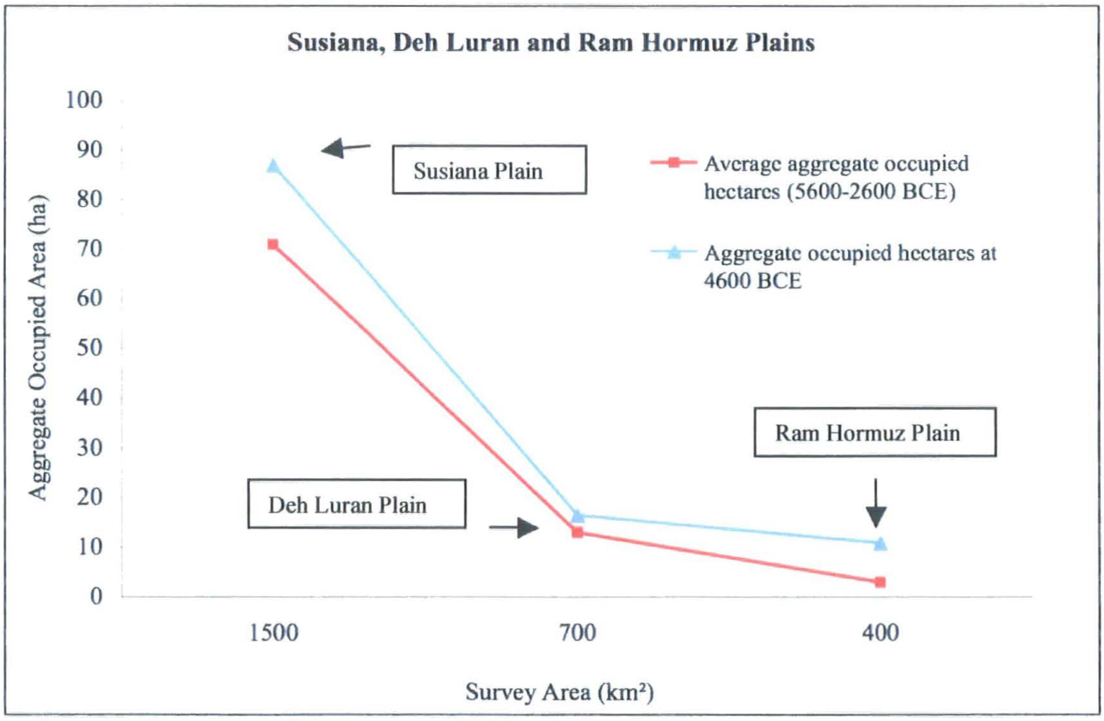


Fig. 6.2: The relationship between the size of the survey area and the average aggregate site area for the time-span being studied.

When the aggregate occupied area was plotted for the three plains at 4600 BCE, generally representing the peak settlement on the lowland plains, a similar outcome was again reached. One can easily see the size of the Susiana plain is far greater than either the Deh Luran or the Ram Hormuz plain. As well, the aggregate occupied hectares on average, and at the peak in settlement, are substantially greater for the Susiana plain. This indicates again the centrality of the Susiana plain, and the peripherality of the other two plains. The Deh Luran plain supports a much smaller sedentary population than the Susiana plain, and the Ram Hormuz plain is capable of supporting an even smaller one yet.

	Susiana Plain	**Deh Luran Plain**	**Ram Hormuz Plain**
Survey Area size (km^2)	1500	700	400
Average aggregate occupied hectares (5600-2600 BCE)	71	13	3
Aggregate occupied hectares at 4600 BCE	87	16.5	10.9

Table 6.1: Data on the size of surveyed plains and the aggregate occupied hectares

6.3 Highland Population Trends

While so far the homogeneity of broad trends in the lowland regions has been asserted, it remains to be seen whether we can make such justified generalizations for the two highland study regions. While geographically separate, both the Kur River Basin in the southern Zagros and the Islamabad plain in the West Central Zagros represent intermontane valleys and plains, and it is this geographical distinction that indicates some degree of similarity as well as isolation. The Kur River Basin stands alone in the highlands of southwest Iran as an example of the site one of the first truly urban centres and demonstrates an aggregate occupied area throughout the period in question far greater than any other (see Figure 6.3). However, there are times when a noticeable degree of similarity seems to exist between many highland regions and these will be discussed below. The chronology for each region has been laid out in Fig. 5.12, and while they are presented on the same time scale they may not be exactly comparable and there may be areas of discrepancy on the timing of certain events. However, viewing these patterns in the *longue durée*, minimizes this issue.

Looking at the trends in the Kur River Basin and the Islamabad plain, several things stand out. Primarily, the overall patterns of growth and decline in the two curves, but not the magnitude, are very similar (see Fig. 6.3). There appears to be an increase from the earliest periods and rather steady aggregate occupied area throughout the sixth millennium. During the course of the fifth millennium there is an increase in the occupied area of both regions, the Kur River Basin quite obviously more so. At the end of the fifth millennium (Lapui phase c. 4000-3500 BCE) there appears to be a significant decline in occupied area of the Kur River Basin and a slight decline in the Islamabad plain. A major decline in the Islamabad, to a minimal sedentary population begins in the Late Middle Chalcolithic (c. 4000 BCE) culminating in the Late Chalcolithic, when information on settlement in this region becomes unavailable. The Kur River Basin experiences a decline in aggregate occupied hectares between the Lapui and Banesh phases (c. 3500 BCE), only to increase through the Banesh phase, and decline again to an almost undetectable pattern of settlement after the Late Banesh (c. 2600 BCE).

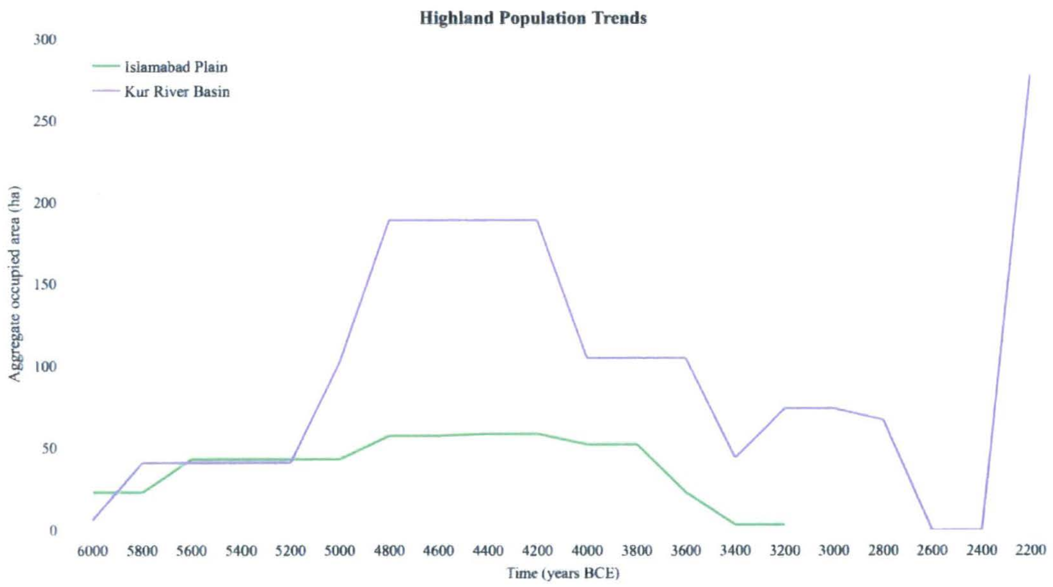


Fig. 6.3 Highland Population Trends.

The difference in the magnitude of growth between the Islamabad plain and the Kur River Basin is partly a function of the size of the plain and its potential for sustaining a large sedentary population, and an array of different social, cultural and political developments. Interestingly, in the long-term the population dynamics of other Central Zagros regions, such as the Mahidasht and Kangavar are similar, and can perhaps provide a proxy for the Islamabad plain data that is unavailable after the Late Chalcolithic. Information on aggregate occupied area for the Kermanshah/Kangavar region shows four significant things: 1) there is a generally stable amount of aggregate occupied hectares during the first half of the fifth millennium peaking at about 75 hectares; 2) there is a marked decline in this variable during the latter half of the fifth millennium to about half the previous; 3) there is a generally low stable population with a slight gradual increase thoughout the fourth millennium; 4) gradual growth beginning in the third millennium occurs, resulting in an unprecedented population peaking in the first half of the second millennium (Schacht 1987: fig. 45; Young 1977). In the Mahidasht the number of sites generally increases throughout the Neolithic and Chalcolithic, dramatically growing at the beginning of the Chalcolithic with the appearance of J ware in the central Zagros and continues to grow into the Late Ubaid period (c. Middle Chalcolithic) (Levine & McDonald 1977: 46-49). A decrease in settled population appears to occur in the Late Chalcolithic (Henrickson 1994).

While there are differences in the timing of events and different trajectories for settlement patterns based on geography, socio-cultural developments, and contacts with other regions, there are general similarities between population trends in the central Zagros in the long-term. There are very small sedentary settlements in the Neolithic that increase and peak by the Middle Chalcolithic, after which the trend reverses and decline occurs, culminating in very minimal population at the end of the Late Chalcolithic (Abdi 2002: 323-327). If the Kangavar/Kermanshah and Kur River Basin data sets are somewhat representative of overarching trends in the Central and Southern Zagros, then we could assume that there would be a massive increase in the populations of the Mahidasht and Islamabad Plain by the second millennium.

6.4 Highlands & Lowlands: spatial dynamics of interregional population trends

6.4.1 Dispersed settlement and small villages

While a steady rate of population growth in the sedentary settlements of the sixth millennium is highly likely, the earliest portion of each curve in this analysis is quite obviously subject to all the caveats concerning burial of the earliest sites under later occupation that has been outlined already (Kouchoukos & Hole 2003; Wilkinson 2003b). Quite unsurprisingly then, all of the aggregate occupied area curves increase from minimal levels in the first half of the sixth millennium and then plateau in the second half of the sixth millennium.

Alternative dynamics that do not fit this pattern and suggest a much earlier apex of Village period occupation on the Deh Luran plain have been posited (Kouchoukos 1998: fig. 3.13). However, this is the result of analysis using the Dewar methodology, following the newer period lengths and the use of settlement size classes for assigning hectarage. This interpretation indicates a village period population peak occurred on the Deh Luran plain in the Khazineh phase (Middle Susiana 1, c. 5700-5500) that tapered off and plateaued in conjunction with a rapid increase in the population of the Susiana plain. This pattern is not so apparent in an analysis of unstandardized data, although a slight decrease in aggregate occupied area in the Deh Luran and Ram Hormuz does appear to happen in conjunction with an increase in settled area in the Susiana plain. However, this is so slight that the suggestion holds little water. The idea that populations migrated from the Deh Luran plain (Kouchoukos 1998: 109) cannot be further clarified by this analysis and remains a speculative but interesting suggestion.

An analysis of the Khazineh phase in the unstandardized data (Neely & Wright 1994) draws attention to the relationship between the total number of sites per period, and the aggregate occupied area (see Fig. 5.11). The aggregate occupied area is about two-thirds the total number of sites for the Khazineh phase, indicating many small sites of a few hectares each. This relationship remains consistent through the Mehmeh phase on the Deh Luran plain. The Ram Hormuz data (Wright & Carter 2003) also demonstrates this trend well for the Middle Susiana 1- 3. Throughout the Middle Susiana the amount of aggregate occupied hectares for each period (between 1.4 and 1.7 hectares) is only approximately half the total number of occupied sites (between 3 and 4) (See Fig. 5.9). These small settlements are characterized as hamlets (*ibid.* 65). On the Susiana plain establishing a comparison between these two variables using the available data (Figs. 6.1 and 6.2) is difficult because of its manipulation. However, the low density and small size of sites on the Susiana plain in the early Village periods was initially noted by Adams (1962). Equally, if the Deh Luran and Ram Hormuz plains can be used as proxy, then a similar pattern can also be assumed for Susiana.

During the Muskhi / Jari and Shamsabad phases in the Kur River Basin the aggregate occupied area increases from 6 to 86 hectares (Sumner 1990a: table 1), while the total number of sites increases from 8 to 102 (Sumner 1994: table 1) (See Figure 5.15). The settlement pattern of these early phases show widespread settlement near springs with an increasing concentration of sites being found in irrigable areas by the Jari and Shamsabad phase (*ibid.* 48). The number of sites appears to almost double between each of these three phases (*ibid.* table 1). The aggregate occupied hectares also appear to double between each phase (Sumner 1990a: table 1), but continue to be less than the total number of sites throughout. Quite significantly, there is a general pattern consisting of comparatively low aggregate occupied area in relation to a higher number of sites in all the lowland study areas and the Kur River Basin during the sixth millennium.

Finally, the Islamabad plain seems to present the only anomaly to this pattern. The total number of sedentary sites per period never exceeds the amount of aggregate occupied hectares of sedentary settlement during the Late Neolithic through Early Chalcolithic. However, the difference between the two variables appears to be at its lowest during this time and increases from the Late Neolithic onward. With the Early Chalcolithic period in the Islamabad plain comes the J ware pottery assemblages and their Northern Mesopotamian Halaf similarities, taken to suggest movement of people to the Central Zagros (Abdi 2002: 333; 2003: 418). In terms of land use, there appears to be an expansion of agricultural practices, using well-watered areas as well as sites that would be most productive if exploited on a seasonal basis (Abdi 2003: 419-420). Abdi (*ibid.*: 420) suggests that parallels in socio-cultural development and agricultural technology can be found in the Khazineh phase on the Deh Luran Plain and the Early Middle Susiana on the Susiana plain. The differences in the causes of initial growth on the lowland plains and in the Central Zagros could be chalked up to natural growth facilitated by a higher than average birth rate and a low death rate, and emigration of foreign groups with their J-ware ceramic assemblage, respectively (Hole 1987b: 83).

In addition to the links between the Central Zagros and Northern Mesopotamia there are several other threads of evidence that indicate limited interregional interaction. Close ties between the Susiana and Deh Luran plains is evidenced by artefact assemblages from Tepe Tula'i, a herding camp in Khuzestan, which suggest that seasonal movement was already being practiced between the two regions, perhaps as early as the Early Village period (Hole 1974; Kouchoukos 1998: 68). Furthermore, Alizadeh (1992: 56) demonstrates that in the MS1 phase there appear to be "close parallels" between ceramics in Deh Luran, Susiana and Southern Mesopotamia. To summarize, the majority of the sixth millennium seems to be a period of expansion of small settlements capitalizing on the agricultural potential of plains and valleys, with the prospect of village based herding and perhaps movement of populations seasonally between lowland plains. This growth in all areas of southwest Iran would suggest an increase in birth rate over death rate and perhaps a migration of people to the area.

6.4.2 Regional population growth, settlement agglomeration

In general, it would appear that populations began to rise again around the beginning of the fifth millennium, as evidenced by an increase in aggregate occupied area throughout the greater region. This increase was especially high and slightly earlier in the Kur River Basin and on the Susiana Plain, followed shortly after by the Deh Luran, Ram Hormuz and Islamabad plains. This highlights the centrality of the two largest regions for sedentary populations.

The lowland plains show notable similarity at this time with a peak in settlement occurring either in the Middle Susiana 3 or Late Susiana 1 period, then a decline towards the end of the fifth millennium (see Fig. 6.1). An increase in settled population in both highland regions is also evident at this time, and it is acceptable to say that there was a generally contemporaneous peak in settlement somewhere in the mid fifth millennium. Discrepancies in the timing of this event based on the use of different chronologies are not so great as to limit making this generalized statement.

Throughout the Village period the Susiana plain seems to function as a two-tiered settlement hierarchy (Hole 1987: 89). There is one large site (Chogha Mish, and then Susa) and many smaller sites, but the relationship between the large site and the small sites is relatively unclear. Settlement size hierarchies have been proposed for the Susiana plain in the Late Susiana (Susa A and Terminal Susa A) by Wright and

Johnson (1975) but the degree of control that a centre such as Chogha Mish or Susa exerted on the rest of the settlements of the plain is highly debatable (Kouchoukos 1998: 113). Equally, by the Mehmeh phase on the Deh Luran, there is one larger site, Tepe Musiyan and a three-tiered site hierarchy is suggested in times of centralization, (Neely and Wright 1994: 168, fig. V.4) but is questionable as there is little other evidence for such a system. However, this indicates the emergence of a few larger sites accompanying the many smaller sites. Just as important is a trend toward settlement agglomeration. On the Ram Hormuz and Deh Luran plains we see a reversal of the relationship between aggregate occupied area and the total number of sites that predominated during the sixth millennium (see Fig. 5.9 and Deh Luran figure). This indicates that people are moving into larger villages, and populations are increasing. Indeed, small villages are quite clearly coalescing into larger ones and important processes are taking place.

The situation in the Kur River Basin also sees the expansion of agriculture and the diversification of subsistence strategies, with settlements taking advantage of good agricultural land, and pasturage (Sumner 1994: 52-57). As outlined in the previous chapter (section 5.4.2) there is a debate about the chronology and periodization of this region during the Bakun phase, which spans the majority of the 5th millennium (see Alizadeh 2006). According to the updated survey data as presented by the original surveyor, the Bakun phase represents a major continued increase in aggregate occupied area and total site numbers from the previous phase (Sumner 1990; 1994). If this is taken to be a best representation of these variables for this analysis than the relationship between aggregate occupied area and total number of sites can be defined as thus: there is a reversal of the relationship between these two variables and the aggregate occupied area becomes greater than the total number of sites during the Bakun phase indicating settlement agglomeration (see Fig. 5.15). Sumner (1994: 58) supposes, based on settlement data from different regions within Fars that there was a three or four fold increase in population between the earlier phases and the Bakun phase. Stylistic traits on pottery of the Bakun phase suggest close links throughout Fars, and some sort of socio-political or economic organization encompassing the greater region has been suggested (*ibid.*: 59).

The most notable feature of settlement in the Islamabad plain in the Middle Chalcolithic phase is the emergence of campsites representing an increased utilization of pastoral resources farther from the sedentary sites (Abdi 2002: 173). Abdi notes a migration from smaller to larger sites by the Mid-middle Chalcolithic. (*ibid.*: 177) This is coterminous with the peak in aggregate occupied area of sedentary sites and the highest number and greatest aggregate occupied area of campsites. It is possible to suggest that the increase in sedentary settlement and agricultural potential is intrinsically linked (at least in this phase) with the increase in pastoralism.

Transhumant pastoralism appears evident by the later Village period in the Susiana plain (Kouchoukos 1998; Hole 1987) and in the Islamabad plain by the Middle Chalcolithic (Abdi 2002, 2003), and it seems that mobile groups were representing a significant portion of the population in Fars at this time as well as exerting a definite political and economic force (Alizadeh 1988, 2003, 2006). This idea has been taken farther to suggest that "control of socioeconomic affairs in Fars during this time may have been exercised by its mobile pastoralist population" (Alizadeh 1992: 60). Indeed, stylistic parallels have not only been suggested within Fars, but also with the lowland plains, most notably in Susiana and the Ram Hormuz. Importantly, the increase in interaction between highland and lowlands, facilitated by the emergence of transhumance or at least an increase in its magnitude, is concurrent with the growth and peak of sedentary populations in the fifth millennium.

6.4.3 Highland/Lowland interaction with transhumance as its mechanism

The evidence for increased contact between the highlands and lowlands in the fifth millennium will now be briefly reviewed. Interaction with Mesopotamia appears to be severed for the most part in the later village period: "There appears to have been a reorientation of interregional contacts" (Alizadeh 1992: 57). In the Late Susiana 1 phase on the Susiana plain pottery styles closely resemble those occurring in the Kur River Basin and may even have originated there. The best example is found in the specific dot motifs from Fars, which subsequently appear in Late Susiana 1 in lowlands, and then continue to be used slightly later in Fars. These same patterns are also found in Behbehan, Ram Hormuz, and Lurestan (*ibid.*: 26). Shifting settlement from the eastern portion of the Susiana plain occurs at this time, which could be linked to this area being traditionally used as winter pasture for mobile groups (*ibid.*: 57), and the increased importance of Susa on the western part of the plain, as a religious centre (Hole 1987: 85). Therefore, the mechanism for increased highland/lowland interaction could well be the 'development' of mobile pastoralist groups (Alizadeh 1992: 26). This conclusion has been questioned because it is based on ceramic similarities, but more evidence including increases in the amount of arsenical copper from the Iranian plateau finding its way on the plain and the similarities in certain types of stamp seals has recently been cited (Kouchoukos 1998: 69). The Ram Hormuz plain also shows ceramic parallels with both Fars and Susiana. In fact Wright and Carter observe: " It seems likely that with the study of larger samples from more sites, there may not prove to be a distinct style border between Khuzestan and Fars but rather a gradual change in the frequencies of design elements and the application of rules for the organization of such elements" (Wright and Carter 2003: 66).

A widespread set of ceramic traditions also links together many regions in the central Zagros. In the early Middle Chalcolithic during the first half of the fifth millennium, there appears a ceramic assemblage known as Dalma ware, an almost homogenous cultural tradition occurring throughout the central western Zagros (Henrickson & Vidali 1987). Found most notably in the Mahidasht and Kangavar, as well as the Islamabad plain, Dalma ware represents a locally produced but widespread tradition (Abdi 2002, 2003). Its distribution does not penetrate into the lowlands or the Iranian Plateau but remained within the central Zagros area probably as a consequence of geographical boundaries (Henrickson and Vidali 1987: 39). Henrickson and Vidali (*ibid.*: 43) suggest the Dalma tradition to be a product of a common ethnicity shared throughout the central Zagros based on language or lineage or faith, not evidence of an organized socio-poliitcal system. This system appears to have lasted only a few hundred years but demonstrates a widespread cultural tradition that could exist in a geographically disparate and isolated area and the possible mechanism that might have been involved in this distribution. Subsequently, pottery traditions become more aligned with the lowlands towards the Middle and Late Middle Chalcolithic possibly as a consequence of movement over longer distances, however, most wares are still locally produced (Abdi 2002: 343).

Bearing directly on the development of transhumance as evidence for organization of pastoralist groups (Alizadeh 1992: 22), through the ceramic similarities shared with the Islamabad and Deh Luran plains (Abdi 2002: 332) are the isolated cemeteries of Parchineh and Hakalan in the Pusht-i Kuh. These burial grounds appear to have been used for a relatively long span of time in the Middle to Late Chalcolithic sometime in the latter half of the fifth or beginning of the fourth millennium (Haerinck & Overlaet 1996). Because these cemeteries are located nowhere near permanent settlements they have been taken to represent the burial grounds of mobile pastoralist groups (Abdi 2002: 332; Haerinck & Overlaet 1996).

Excavations at Tuwah Khoshkeh in the Islamabad Plain provide extremely telling evidence associated with the increase in highland and lowland interaction and a shift towards more mobile populations. There are ceramic similarities to the local Red-White-and-Black ware and the Black-on-red ware to the Late Siahbid phase in the Mahidasht and Kangavar, the graves from Parchineh A in the Pusht-i Kuh, and the Farukh and Suse phases of the Deh Luran plain (Abdi et al. 2002: 55). This would suggest the movement of mobile groups between areas in the Central Zagros and the Deh Luran plain in the lowlands, and situate Parchinah and Hakalan along the route between seasonal pasturage (*ibid.*: 332). Further, Wright and Johnson (1975: 275) suggest that there appears to be resettlement on the Deh Luran plain to different locations, associated with the appearance of highland ceramics and evidence for 'fortifications' in the form of stone walls. This of course would suggest to them some sort of conflict in the form of highland intruders into the lowlands, or conflict between mobile and sedentary communities, however there is little evidence for this. They use the term "locally unsettled condition", which makes it difficult to superimpose this pattern on other regions or propose any sort of widespread conflict occurring on an interregional scale. However, it has been suggested that 'unsettled conditions' between mobile and sedentary groups were common in the fifth millennium as a result of the competition for land (Alizadeh 2006:24).

Changes brought about by increasing agricultural productivity are evident in this phase. Through the earlier Village period and culminating in the later village period, there was an expansion of agriculture and sedentary populations on the plains in southwest Iran. As a result pasture would most likely become harder and harder to find and so forced herding to gradually retreat farther and farther from a village base (Abdi 2003: 438). The shift from horizontal to vertical transhumance has also been postulated as a result of this agricultural expansion and land clearing, making movement between highlands and lowlands a more feasible venture (Kouchoukos 1998: 69). With the increasing number of settlements and the trend towards agglomeration in larger settlements, there is an increase in highland/lowland interaction as evidenced by the ceramic assemblages, especially c. the mid to late fifth millennium.

6.4.4 Population Decline

By the Late Susiana 2 (Susa A or Earlier Suse phase) all three lowland regions suffer a decline in sedentary population as evidenced by a decrease in the total number of sites and aggregate occupied hectares (Kouchoukos 1998: 109; Wright and Johnson 1975: 275). There appears to be an abandonment of the marginal plains first (that is the Deh Luran and Ram Hormuz plains) (Wright and Johnson 1975: 275: Hole 1987a: 85). This is apparent in Fig. 6.1, where the Susiana plain does appear to sustain a larger population for longer before suffering a decline in aggregate occupied area. This phenomenon has been described by Henry Wright (1987: 143) as occurring throughout the Village period, culminating in the Susa A period and described as the "decline of the hinterlands". This brings into focus the relationship between the Susiana plain, and more marginal areas like the Deh Luran and Ram Hormuz.

Interestingly, in several other peripheral regions of the Susiana plain that are located in the Zagros foothills, namely Izeh and Hulailan, the decline is not so substantial. These areas also show evidence of mobile pastoralism, and if as suggested were aligned with nomadic groups, may have been better suited to adapting to the socio-economic and political breakdown occurring on the Susiana plain (Wright 1987: 144). This entire process occurring on the lowland plains may in fact be related to the massive increase in populations around Uruk in southern Mesopotamia (see Adams 1981).

According to the data on the Terminal Susa A period from Johnson (1975), the relationship between aggregate occupied area and total number of sites indicates that while there are much fewer sites and less area settled, there appears to still be a trend toward agglomeration (see Fig. 5.5). A similar observation can be made for the Deh Luran and Ram Hormuz plains; *there is a marked decrease in both variables but the relationship remains the same as it did in the previous period in both regions.* So despite a decrease in population, settlement nucleation is favoured over dispersal into the countryside (see Figs. 5.9 and 5.11).

The Late Middle Chalcolithic (c. 4000 BCE) in the Islamabad Plain sees a continuation of the relationship in which the aggregate occupied area is greater than the total number of sites and that has continually been the story from the late Neolithic onwards, however there is a slight decrease in both the number and aggregate occupied area of sedentary and campsites (see Fig. 5.19). Substantial decreases in the number and area of sedentary sites and the complete disappearance of campsites occurs in the following phase (Early Late Chalcolithic c. 3700 BCE) (Abdi 2002: 179). Because Uruk wares do not seem to make their way into the Islamabad Plain assemblage until the Late Late Chalcolithic, it could be suggested that the initial decline felt between the Late Middle and Early Late Chalcolithic was linked to regional developments. The most likely of these being the increase in mobile pastoralism farther and farther away from sedentary sites, resulting in full-fledged nomadism (Abdi 2002).

The Late Bakun in the Kur River Basin has ceramic parallels with the Middle and Late Farukh on the Deh Luran plain and, while the painting styles are different, there is evidence of links between Late Bakun and Susa A (Voigt and Dyson 1992: 139-140). Alternative population trends have been proposed for the Kur River Basin in the Bakun phase, which would suggest a decrease in settled area and population at the end of the phase (Bakun A) and that this supposed decline preceding the Lapui phase is coterminous with the end of the Village period (Alizadeh 1992: 57). This allows for the reinterpretation of the succeeding Lapui phase as a time of sedentary population increase (Alizadeh 2003b: 90; 2006: 50). This concept will be dealt with further in the next section. However, these discrepancies may again be 'noise' that serve to obstruct the overall pattern found in the data. Whichever periodization is followed there appears to be a decline at the end of the fifth millennium that may or may not be followed by resurgence in sedentary settlement.

Viewed on the long-term scale, the fifth millennium is a period of growth and general stability of the system until the end of the millennium. Increasing populations and settlement nucleation appears to be linked to expansion of both agricultural and pastoral modes of subsistence perhaps leading to instability towards the end of the fifth millennium, which becomes even more apparent in the next phase. Characteristic of the time frame is a pattern of regional growth, and agricultural intensification, coupled with an increase in transhumance resulting in more and more interaction between each region.

Insights into the changing environment can be gained from paleoclimatic data, and compared to these observed trends. Overall the early Holocene climate is considered warm and dry with a general rise in humidity through to the mid-Holocene where there is a general increase in overall moisture (Lemcke & Sturm 1997; van Zeist & Bottema 1982). Pollen cores and oxygen isotope analysis from Lake Zeribar indicate spread of oak forest and higher oxygen isotope levels (Stevens et al. 2001; van Zeist & Bottema 1977; van Zeist & Bottema 1982). At Lake Van paleosalinity levels, oxygen isotope, and pollen cores indicate high lake levels, moist conditions and increase in oak and pistachio (Wick et al. 2003). The developments that we see beginning in the fifth millennium in settlement across the board in southwest Iran are therefore occurring during a phase of higher moisture and a wetter climate. This has previously been observed for the Kur River Basin and north Jazira (Wilkinson 2003b). These middle Holocene conditions continue through the majority of the fourth and third millennium when settlements continue to nucleate, and fluctuate between regional periods of growth and decline.

6.4.5 Mesopotamian growth, early state formation, urbanization

There has been much discussion about the Uruk period and early state formation centring on the early fourth millennium, especially in the Khuzestan plains (Adams 1966; Algaze 2004; Hole 1987c; Johnson 1973; Stein & Rothman 1994; Wright & Johnson 1975, 1985; Wright et al. 1975). It has been convincingly suggested that early states emerged in the Middle Uruk period on the Susiana plain (Wright and Johnson 1975). Here I will focus upon population trends associated with this event rather than debating socio-political formations and will not pursue a discussion of the relationship between population pressure and cultural change (Smith & Young 1983; Weiss 1977; Wright & Johnson 1975).

Increased interaction between highlands and lowlands throughout the fifth millennium culminates at roughly the same time as aggregate occupied area is at its highest in all the study regions. Towards the end of the fifth millennium there appears to be a decline in all of the regional populations concurrent with unprecedented growth occurring around Uruk. Massive increases in settled population in southern Mesopotamia would require a great influx of people from other regions (see Adams 1981, Pollock 2001). Decreases in the settled populations of the Susiana lowland hinterlands (i.e. Susiana and Ram Hormuz), and subsequently decreases in the settled population of Susiana itself would suggest that sedentary populations were moving away from these regions. Movement towards Susa from the hinterlands could also be a response to localized pressure by mobile populations (as per Wright 1987; Neely and Wright 1994), while exploitation of pastoral resources on the eastern portion of the Susiana plain by mobile groups would explain the westward shift of sedentary settlement (see Alizadeh 1992; Hole 1987). Following the late fifth millennium decline in regional populations, the early fourth millennium sees major growth on the lowland plains, and decline in the highlands in response to the expansion from southern Mesopotamian as part of the Uruk phenomenon.

The Early and Middle Uruk periods represent the zenith of aggregate occupied area in the Uruk cycle for the Susiana, Ram Hormuz, and Deh Luran Plain. Interestingly, while the Uruk period appears to have been a time of maximum growth on the Susiana plain prior to the second millennium, the total occupied area in Deh Luran at this time is equal to the levels reached in the Village period, while in the Ram Hormuz the aggregate occupied area never reaches the levels that it did in the Village period. Wright and Johnson (1975: 275) note that the 'marginal areas' still have lower populations than they did in the Late Susiana 1 period (Susiana d period). They suggest this is because population is concentrated in a central place (i.e. Susa and the Susiana plain). Wright (1987: 146) sees the general influence of Susiana in the Ram Hormuz and the Izeh plain at this time, with however, a decrease in the influence of Susiana material in the Deh Luran and Hulailan. But there is evidence of mobile pastoralism in both Zagros front-range settlements. In Izeh, in the Zagros foothills there is a dramatic increase in settlement in the Early Uruk period (Wright 1979: 128, fig. 52)

The tendency towards settlement agglomeration continues through the Uruk phase in the lowland plains (see Figs. 5.5, 5.9, 5.11). In Susiana according to Johnson's (1973) data from the Terminal Susa A through the Uruk phases the aggregate occupied hectares are higher than the number of sites, and even when in the Late Uruk phase there is a marked decrease in permanent settlement the amount of aggregate occupied hectares is almost four times the number of sites indicating that population is sparse but concentrated into larger settlements (see Fig. 5.5). The Ram Hormuz plain again generally follows suit and there appears to be a trend toward settlement agglomeration.

The Lapui phase in the Kur River Basin, which is comparable to Late Susa A or the Early Uruk phase (Voigt & Dyson 1992: 140), Godin VII, and the Bakhtiari mountains (Sumner 2003: 51), indicates an almost equal relationship between the number and aggregate area of sites, but settlement agglomeration is apparent in the Banesh phase. (see Fig. 5.15). Sumner (1986: 207) has suggested that the Lapui phase represents a decrease in sedentary settlement reflected by a shift towards nomadism caused by a decrease in agriculturally productive land due to salinization. In this sense, the urban centre at Tal-i Malyan, which rose to prominence in the Banesh phase was part of a tribal society that involved both modes of subsistence and unity across the southern Zagros (*ibid.*: 207-209; contra Wright and Johnson 1975 state formation theories). Alternatively, Alizadeh (2006: 49), has proposed that the Lapui represents an increase in sedentary settlement from the preceding phase evident in an increase in the number of mounded sites. This interpretation supports the idea of settlement agglomeration in the sedentary populations.

Contrary to this is the data from the Islamabad plain in the Late Late Chalcolithic, which presents a different picture. The number of sites remained about the same as in the Early Late Chalcolithic, but the aggregate occupied area has decreased four fold. This indicates that the size of settlements has decreased drastically and people no longer appear to be living in large sedentary groups. Concurrent with this development in the appearance of Uruk related wares on the plain, and the possibility of an Uruk enclave at Chogha Gavaneh similar to the one at Godin Tepe (Abdi 2002: 179). Suggested to account for the decrease in the settled population of the central Zagros in the western and southern areas is the increase in settled population in Uruk lowlands and areas of Uruk influence, a migration towards the northeast portion of the central Zagros, or a shift in subsistence towards a fully mobile lifestyle (Henrickson 1994: 94; Abdi 2002, 2003).

6.4.6 Sedentarization and nomadization

After a zenith in sedentary populations on the Susiana and Deh Luran plains, the later fourth millennium saw a decrease in settled population with the Late Uruk phase (Johnson 1973; Wright and Johnson 1975). In Susiana, the aggregate occupied hectares decrease to less than half, and the total number of sites to less than a third (see Fig. 5.5). In the following Susa III period, according to Alden (1987), there are very few sedentary sites and overall a very low population. He has suggested that the plain was being utilized by a small sedentary population, participating in village based herding, but that there was very little contact with transhumant or nomadic groups from the highlands or outside of the Susiana plain (*ibid.* 160). This paints a picture of extreme isolation. However, he also notes that the northern and eastern parts of the plain were abandoned and the settlement pattern in this respect mimicked the Late Susiana phases (*ibid.*). If this is so, then it does not seem far-fetched to suggest that the eastern and northern portion of the plain were again being utilized by transhumant groups, and the remaining sedentary population retreated towards Susa, as has been suggested for the Late Susiana (see Alizadeh 1992: 57; Hole 1987: 85). Interestingly, despite a very low population being proposed there is still a pattern of settlement nucleation in the occupied sites (see Fig. 5.6). The Susa III population decline may also be linked to incredibly high population growth and urbanization occurring in Sumer, as well as the Banesh phenomenon in the Kur River Basin representing an early urban polity (Carter and Stolper 1984: 117).

Alden's interpretation gives a picture of Susa III settlement in isolation to the preceding and succeeding patterns. The incredibly low numbers that Alden sites for this phase are in contradiction to those given by both Miroschedji (2003) and Schacht

(1987). While in these interpretations there is a significant decrease in settled population, there also appears to be a recovery towards the end of the phase that continues through the third millennium. In the later Susa III period equivalent to the Early Dynastic I/II in Mesopotamia (Alden 1987: fig. 39) there is an unprecedented trend apparent in both the Susiana and Deh Luran Plains through the third and into the second millennium: an increase in aggregate occupied area greater than any seen previous in the lowlands (see Fig. 6.3).

Aggregate occupied area decreased steadily from the Early to Late Uruk in the Deh Luran plain (see Fig. 5.11 and 6.3). During the Late Uruk period, settlement appears to have dispersed slightly, and the trend toward settlement agglomeration abated. In the following phase, Jemdet Nasr, while the area occupied remains relatively stable, the site numbers decrease indicating movement in larger settlements. This trend is maintained and magnified in the Early Dynastic I/II in which there is unprecedented population growth on the plain (Neely and Wright 1994: 178). Interestingly, in the Susa II (Uruk periods), Susa and Deh Luran share characteristics of Mesopotamia, but in Susa III (Jemdet Nasr to Early Dynastic) Deh Luran shows more close resemblance to Diyala and Hamrin (Carter & Stolper 1984: 121). This massive population increase may have required immigation from other areas as well (Neely and Wright 1994: 178).

In the Ram Hormuz plain, only one settlement, Tal-i Ghazir, survives into the late fourth millennium, which is characterized as a "small Banesh phase centre" (Wright and Carter 2003: 67). Several possibilities are suggested for Ghazir's survival: the protection and facilitation of trade from the highlands to the Khuzestan plains, or seasonal winter pastures of mobile groups occupying the Ram Hormuz plain. The idea of the centre at Tal-i Malyan and the Kur River Basin dominating the southwest Iranian arena in the late fourth early third millennium (Alizadeh 2006: 98), might explain the situation in Ram Hormuz. With low isolated populations apparent on the Susiana plain, it is possible that Ram Hormuz had greater affinities with the highlands for purposes of trading and communication and mobile networks. Wright and Carter (2003: 67) express surprise that the Ram Hormuz plain has no evidence of sedentary occupation during the mid to late third millennium. However, they note that the ceramics of this period were poorly known and future restudy might shed more light on the sedentary occupation in this region during this period. Equally, this is not so surprising if you consider the Ram Hormuz to be closely linked with the population trends of the Kur River Basin at this time.

In the Kur River Basin, the Early Banesh phase sees ceramic similarities to the Uruk period, while the Middle Banesh seems to equate chronologically with the Later Uruk and Early Susa III. The Late Banesh find parallels to Susa IIIB-IVA and by extension ED I/II (Voigt and Dyson 1992: 140-142). Sumner (1990: 13-14, fig. 4) suggests a shift toward full-fledged nomadic pastoralism occurring from the Lapui phase through the Banesh phase, then resulting in the hiatus or depopulation in the middle of the third millennium. This several hundred year depopulation, has traditionally been referred to as a hiatus in sedentary occupation in the region (Sumner 1986, 1990), but more recent excavation at Tal-i Malyan has revealed some continuity between the Banesh phase and the Kaftari (Alden et al. 2005; Miller & Sumner 2004). Through this phase the very low settled population interacting with a largely nomadic one that stretched beyond Fars into the central Zagros may have been responsible for the socio-political developments of the Kaftari (Miller & Sumner 2004; Miroschedji 2003) and the massive population increase in the Kaftari may be the result of the sedentarization of fully nomadic groups (Sumner 1990a).

Decreasing agricultural productivity and a greater reliance on herding due to increased soil salinity as a result of mismanagement of irrigation systems is traditionally cited as the cause of the mid-third millennium hiatus (Sumner 1986). Notably, this trend appears to occur just prior to a phase of increasing aridity indicated in pollen data, oxygen isotope and other paleo-climatic proxy indicators from Lake Van occurring between approximately 4100-2100 BP (Lemcke & Sturm 1997; Wick et al. 2003). This would mean that a failure in the agricultural system was ultimately responsible for the sedentary depopulation of the Kur River Basin, but that the subsequent resettlement or sedentarization of mobile groups in the area occurred during a time of increasing aridity.

Sumner's (1990: fig. 4) published curve of population trends in the Kur River Basin postulates the trajectory for the mobile pastoralist population as well as the sedentary communities. This diagram suggests that this population grew rapidly from the

Bakun phase through the Lapui, Banesh and the hiatus and continued its exponetial growth in the Kaftari phase when there was massive sedentary repopulation of the plain. True nomadism in the Kur River Basin has been questioned, by the assertion that the groups inhabiting this area would only be truly mobile when migrating and would spend a good majority of there time in contact with urban areas (Alizadeh 2006: 1). Therefore, the reliance on each other and similar resources would indicate that these two groups were not mutually exclusive and the fortunes of mobile groups tied to the prosperity of sedentary settlement. In this sense, times of sedentary depopulation do not necessarily equate with full-on nomadism. However, ethnographic observations of the Basseri tribe in Fars indicates that the nomadic communities main supply of agricultural and industrial products do not come from large centres, they come from individual relationships with small villages along the migration routes. Market purchases in larger towns only account for a small percent of transactions (Barth 1964: 98-99). Returning to Sumner's curve, I feel it suggests that the visibility of nomads, and perhaps the formation and function of nomadic groups changes with the intensity of sedentary settlement. Therefore, when sedentism and urbanization are high, mobile groups are more visible (Finkelstein 1992; Finkelstein & Perevolotsky 1990).

The Late Chalcolithic population trends in the Islamabad plain were reviewed in the last section, but the concepts dealt with could equally pertain to this discussion. Unfortunately, there is no data for settlement in the plain after c. 3200 BCE. Pivotal to this discussion, however, is the suggestion that transhumant groups have become more and more mobile, and less tied to a sedentary base. By the end of the Chalcolithic the majority of the population inhabiting these regions would have been fully mobile (Abdi 2002: 348; Henrickson 1994: 94). Supporting this is the evidence from the earlier periods mentioned previously. The number of campsites decrease from the Late Middle Chalcolithic onwards, and eventually disappear, but as they are decreasing the ones that survive were on routes of communication between plains suggesting long-range travel (Abdi 2002: 179). Therefore, the massive decrease in sedentary population at the end of the Late Chalcolithic in the Islamabad plain and all but the very faintest traces of sedentary population in the Kur River Basin during the mid third millennium could in fact represent phases of massive nomadization of the majority of the population. The key point that needs reiteration is that by the third millennium we are seeing truly significant disparities between the population trends of the highlands and lowlands of southwest Iran, dynamics that could possibly be explained by major shifts in subsistence along the sedentary-nomadic continuum.

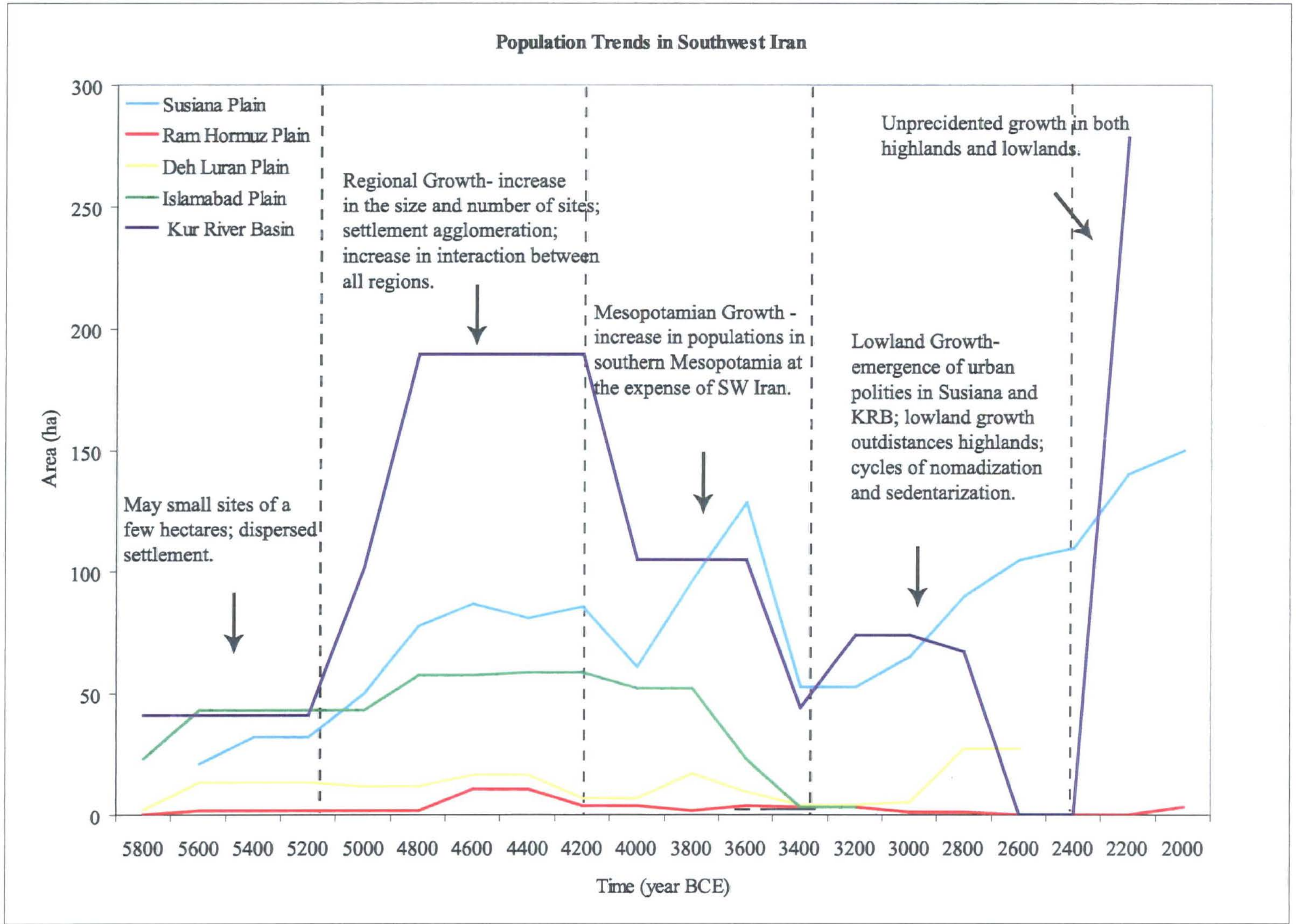


Fig. 6.4 Interregional Population Trends in southwest Iran.

6.5 Beyond the Greater Region - Southwest Iran and Mesopotamia

A comparison of population trends within southwest Iran provides interesting information on the similarities and differences in the trajectories of development between regions. However, it is also necessary to take into consideration what is occurring beyond the greater region, most notably in Mesopotamia, especially since it has been demonstrated that ceramic similarities between these two greater regions are present. Carter and Stolper (1984: 4) define Elam (as at least parts of southwest Iran would be called in historical periods) as consisting of Susa and Khuzestan at its maximum. At times this area is quite closely linked to Mesopotamia while at other times closely linked with highlands. In contrast the highlands are less likely to be influenced directly by Mesopotamian, though there are of course exceptions (i.e. the Uruk phase). Others has suggested that at times the highland regions of southwest Iran may have been part of, and at times dominated, the greater Elamite territory, and parts of Mesopotamia (Miroschedji 2003). However the relationship between Mesopotamia and southwest Iran is defined, it must be given some consideration in order to better understand times of increased interaction, and migration in these regions.

During the sixth millennium it has been demonstrated that various ceramic traditions have suggested an influx of people from Northern Mesopotamia into the central Zagros (Abdi 2003, 2003), and cultural influence perhaps also facilitated by migration between the lowlands of southwest Iran and Southern Mesopotamia (Alizadeh 1992). The settlement pattern in Mesopotamia during the earlier Ubaid phases closely resembles that in southwest Iran, with small independent settlements. However, just like in southwest Iran, regional differences occur between northern and southern Mesopotamia in the density and clustering of sites (Adams 1981: 58-59). Adams (*ibid.*) suggests a greater interaction between sedentary communities and a mobile lifestyle in northern Mesopotamia, which is not surprising as we find greater links between this region and the central Zagros Mountains.

Throughout the fifth millennium local cultural traditions dominate, and towards the latter half of the millennium we see increased interaction between highland and lowland areas in southwest Iran, manifested in similar pottery traditions (Alizadeh

1992; Abdi 2003; Sumner 2003). It appears that there was less interaction between Mesopotamia proper and the major study regions of southwest Iran through to the Later Susiana (Late Ubaid in Mesopotamia). Interestingly, Adams (1981: 60) notes that "there is little reason to doubt that at least the sedentary part of the population was larger and more denser in parts of Khuzestan during much of the Susiana sequence than it was anywhere in southern Mesopotamia during roughly the same interval". Just like in southwest Iran, the regions of Mesopotamia appear to have undergone regional growth throughout the course of the fifth millennium, however, the magnitude and configuration of this development was unique to each region. This brief description serves to provide a context for the following Uruk phenomenon.

The Uruk phase (c. beginning of the 4^{th} millennium) represents a very clearly defined cultural intrusion from Mesopotamia into southwest Iran in both the lowlands and the highlands of the west central Zagros created by the need for greater access to resources from the Iranian Plateau (Algaze 2004; Henrickson 1994; Johnson 1973; Miroschedji 2003; Pollock 2001; Young 1969). Adams (1981: 60, 69-70) suggests that the dramatic growth at the beginning of the Uruk phase required massive immigration and/or sedentarization of mobile populations on top of general population growth, after which the population and urban growth of Mesopotamia was far above that of southwest Iran. Hole (1987: 85) indicates his belief in the Late Susiana (Susa A) population decline linked to an increase in Mesopotamian populations in the Early to Late Uruk that hinges on the assumption that the Uruk phase began earlier in Mesopotamia than in Iran. Notably, in both the Susiana (Johnson 1973) and Ram Hormuz (Wright and Carter 2003) plains the apex of Uruk period growth finds itself in the Middle Uruk, slightly later than the initial increase in Southern Mesopotamia, possibly indicating further movement within the Uruk 'world'. However, the increases on the Khuzestan plains in settlement follow a decrease in the preceding period, which differs from the situation in Mesopotamia (Adams 1981: 70). This reinforces the notion that Mesopotamian growth was at the expense of population in southwest Iran in the late fifth millennium.

An emigration from northern Mesopotamia to southern Mesopotamia by the Late Uruk phase is also suggested by the settlement data but cannot account for all of the population that would seem to have abandoned their homes in the northern region

(Adams 1981: 70). Pollock's (2001) reanalysis of this situation through the use of Dewar's algorithm has suggested that the decrease in population in the northern parts of Mesopotamia was not so marked, and has implications for movement beyond the Uruk heartland. She suggests that instabilities in southern Mesopotamia made it more likely for people to immigrate to the 'peripheries' in order to escape, but equally that northern Mesopotamian population levels could have remained low because they were constantly losing population (*ibid.*: 220). In, whatever form it took there appears to have been a substantial influx of immigrants and ideas from Mesopotamia influencing the population trends occurring in southwest Iran.

Concentrating on an explanation for the cycles of growth, expansion and collapse seen in the population trends of the Susiana Plain and the Kur River Basin, Miroschedji (2003) has suggested that there are two systems working in tandem within southwest Iran; the Irano-Mesopotamian system and the Elamite system. Briefly, the former involves the cycling of control in southwest Iran, especially in the lowlands, between Mesopotamia and highland polities. The latter system involves a more regional view, in which the relationship between the highlands and lowlands of southwest Iran is explained. The functioning of each system is dependent on the other, as the amount of contact between southwest Iran and Mesopotamia affects the relationship between the highlands and lowlands. Also, with the emergence of transhumance (which he places in the fourth millennium), another major factor is introduced into the functioning of the system (*ibid.*: 22-23).

He concludes that during the Uruk phase southwest Iran was part and parcel of the Mesopotamian system (*ibid.*: 24); however, the Elamite system (cyclical variations in settlement, population and power between the highlands and the lowlands) existed previously and continued to exist long after any Mesopotamian influence could be felt (*ibid.*). Therefore, the concepts presented in the Elamite system can be adjusted to describe what is perhaps occurring in the fifth millennium in southwest Iran during a period of regional growth. While perhaps we do not see the integration of the entire greater region under the auspices of a centralized socio-political system based in either the Susiana plain or the Kur River Basin, we do see growth and increased interaction between highlands and lowlands facilitated by transhumance (which I would argue emerged by the mid fifth millennium based on evidence from Abdi 2002, 2003; Alizadeh 2006). Then with the draw of Uruk in the Early Uruk phase and the Uruk influence shortly after exerting itself in the lowlands, and to some extent in the highlands (i.e. Godin Tepe), it was possible for some of the highland regions to remain relatively autonomous.

The concept of an alternating Irano-Mesopotamian and Elamite system again comes into play in the aftermath of the Uruk decline when Miroschedji (2003) suggests the disappearance of Mesopotamian related assemblages and the formation of urban polities in both Susiana and the Kur River Basin. However, this development was not necessarily synchronous, as already observed. The subsequent decline of the Banesh phase settlement in the Kur River Basin with the majority of the population becoming nomadic, is juxtaposed by the increase in settlement in all the lowland areas resulting in exponential growth at the end of the Susa III beginning of the Susa IV phase (*ibid.*: 24-25). Like the lowlands of southwest Iran, one of the most notable trends of the phases succeeding the Late Uruk decline in Mesopotamia is the explosion of settlement indicated by increased aggregate occupied area and large settlements that occurred in the Early Dynastic phase (Adams 1981: 90). This distinct difference in settlement trajectories in lowlands of southwest Iran and Mesopotamia on one hand, and the Zagros Mountains on the other reinforces the idea of cycles of nomadization and sedentarization. A much more fine-grained analysis could be done on this topic, and it is noted that this analysis will have barely scratched the surface of the complex population and settlement trends that were occurring in Mesopotamia. However, it has served to demonstrate the fluctuations in populations are affected on levels beyond the greater southwest Iranian region in the short and long-term.

6.6 Demography and models of long-term population change

6.6.1 Birth, death, migration and changes in subsistence strategies

In order to establish population trends for a region one needs to consider the demographic factors that produced them. Birth rates, death rates, migrations, and in this case, shifts in subsistence strategies all play a key role in the trends considered in this study. Demographics of archaeological populations are made difficult by an incomplete archaeological record and lack of written records, especially for the prehistoric periods. A short consideration of these demographic factors in agricultural, urban and mobile societies will be undertaken.

Growth in the area and numbers of settlements as seen in the sixth and fifth millennium throughout southwest Iran, must in part be a factor of natural population growth caused by a higher birth over death rate. Neolithic populations in general experienced a rapid rate of population growth at the transition to sedentary farming communities. This rapid growth rate was probably not outdistanced in later periods, but through to early complex societies it may have come close, maintaining a rather high rate of growth per year. This is explained by the need for large families and "large population units" that are required by early sedentary communities (Hassan 1981: 234). Following on, it is likely that in "early urban conditions" the birth rate was not substantially heightened and would not account for massive increases in population. If constant immigration did not occur, it would be unlikely that early urban populations would be able to sustain a high population (*ibid.*: 235). Migration as a demographic concept is different than the movement of mobile pastoralist, or nomadic populations. It implies movement from a donor population to a recipient population (Chamberlain 2006: 38). Therefore, it is likely that mass migrations of people were a key factor in phases like the Uruk in southwest Iran and Mesopotamia. Migrations, as Pollock (2001) has suggested to the 'peripheries' (i.e. southwest Iran) of the Uruk heartland in the Late Uruk period could be a way to escape political instability, or as an escape from disease and unrest (Chamberlain 2006: 39). Migration should be considered as one of several factors accounting for the increase in population experienced at this time and in the Susa III, Early Dynastic and Kaftari phases in southwest Iran (i.e. Adams 1981; Pollock 2001; Sumner 1986, 1990a), as higher birth rates than death rates cannot account for it alone.

The rate of growth in agricultural populations over the long-term probably does not exceed an average of 0.1% a year, but this average masks the variability that was actually occurring from year to year linked with the ups and downs in productivity associated with cultivation (Hassan 1981: 253). It has been suggested that sedentary populations lack mobility and group flexibility as a coping factor with which to deal with times of stress (*ibid.*). In a sense this is very true, but it could be suggested declines in sedentary populations due to a wide array of social, economic, political and environmental factors may encourage the adoption of a more mobile lifestyle. This may also explain why in times of sedentary population decline like the Late Uruk and Early Susa III period on the Susiana, Deh Luran and Ram Hormuz plains there is a general tendency for settlement agglomeration to continue (See Figs. 5.5, 5.6, 5.9, 5.11). There is higher social organization in larger centres and less group flexibility perhaps pre-empting a shift to a more mobile lifestyle.

There is little difference in the mortality rates of hunter-gatherer and agricultural populations, but there is a difference in the fertility rates. Higher average fertility rates are noted across the board in agricultural populations due to various factors: sedentism, more readily available food, and children who can contribute to the household earlier (Chamberlain 2006: 69). However, it would be wrong to characterize mobile pastoralist populations as similar in composition with hunter-gatherer groups strictly on the basis that they are more mobile. Mobile groups share many of the characteristics with agricultural populations that would increase fertility rates. In fact, ethnographic sources indicate that nomadic groups now and in the past have had a consistently high birth rate and rate of increase, and are less likely to be affected by disease or famine as much as agricultural populations because of their mobility (Barth 1965: 115-116).

Because this growth rate is extremely high and if left unchecked would not be able to be sustained we must assume that there are processes that are controlling the size of nomadic groups. Barth (1964: 116) suggests that in every generation there are two processes which help to slough off excess population: sedentarization and emigration. Sedentarization occurs when a few individuals or entire groups become sedentary; for example entire villages of nomadic Basseri origin exist in Fars (*ibid.*). Another example is found in the valley of Izeh, in the Zagros foothills where there were 45 villages all of which were inhabited by sedentarized component of the Bahktiari within the last 100 years, as the Izeh area provides good farm-land but is also used for transhumant pastoralism (Wright 1987: 38). This is a good example of the rather short time frame in which large amounts of a population can switch subsistence strategies and cause fluctuations in the long-term population trends of a region.

As nomadic populations continue to exponentially grow they must slough off a lot of population in order to maintain their social organization. Barth (1964: 121-122) hypothesizes that because of crowding or disease and so on, a sedentary population is more likely to suffer a population decrease and the constant flow of mobile people into sedentary communities or entire groups into sedentary villages maintains this balance. There is balance in both emigration to and from different mobile groups and sedentarization / nomadization: "rates of movement into and out of the villages are… sensitive to economic and political conditions: in times of peace and strong administration, the flow towards the villages increases, while in times of economic stress and chaos…villagers and even whole sedentary communities may assume nomadic life" (*ibid.*: 118). The entire process of sedentarization and nomadization is enabled by the fact that households are economically 'autonomous', and the size of a camp is relatively fluid and dependent upon the season, and therefore each part does not directly affect the whole (Alizadeh 2006: 19-20; Barth 1965: 124; Beck 1986; Johnson 1983).

The cumulative total of all these factors create the picture that we see in the population trends. The fluctuations between periods of growth and decline, disparities and similarities between regions can be understood as imbalances between birth and death rates, migrations and shifts in subsistence patterns. The processes of sedentarization and nomadization may greatly affect regional and interregional population dynamics and the ability to fully understand these interactions is hampered by the invisibility of segments of the population in the archaeological record. Perhaps the long-term population trends of a greater region such as southwest Iran that is highly influenced by a geographical dichotomy of highlands and lowlands would find themselves in greater balance if we had the ability to get beyond such an insurmountable problem.

6.6.2 Models of Population Growth – the local, regional and global

> "…local human populations have experienced wide swings and probably have not eliminated completely demographic responses to a fluctuating environment. Global human population growth appears relatively steady and smooth at least in part because the global population is the sum of many fluctuating local populations. The

> growth of a local human population may appear relatively steady if the interval of observation is as short as a century of two, but will appear much less steady over a longer period" (Cohen 1995: 41)

The relationship between the visible representations of population trends presented here and modelled graphs of expected population growth are not always in congruence. Quite obviously the scale upon which population trends are presented greatly affects the resolution of growth and decline and this topic will be briefly touched upon. Long-term population models quite commonly follow one of two forms: exponential and logistic and are frequently used to describe the trajectory of the global population over the course of human history. Exponential growth rates can be used to calculate the doubling time of a population. That is, the number of years that a population will take to double if growth occurs at a particular rate. However, the problem with estimating the exponential growth of a population is that the growth rate is constant and population will continually increase with greater rapidity over time (Chamberlain 2006: 21, fig. 2.3; Cohen 1995: 82-84). Arithmetic-exponential growth models the earth's population as having been very small, with very slow growth until the population explosion in the industrial revolution (Whitmore et al. 1990: 25).

Logistic growth is a way of estimating population growth taking into account the resource competition and the slower growth of populations as they reach their carrying capacity. (Chamberlain 2006: 21, fig. 2.3). Other models of logistic growth identify several 'revolutions' or 'cycles', such as agricultural, through which we see population growth and the increase of the earth's carrying capacity (Whitmore et al. 1990). However, logistic curves do not account for migrations in and out of a population and historically have been proven inadequate to predict the ceiling of population growth, as predicted carrying capacities have been exceeded in numerous historical examples (Cohen 1995: 84-88).

Notably in all these global population models, the study period in this paper would appear to have populations quite infinitesimal in comparison to later population trends. To such models, the diversity apparent at a regional level have no effect, and population declines appear insignificant. The peaks and troughs apparent in graphs of regional and interregional population trends are completely obliterated in a larger-scale long-term study. However, global population trends must be sums of the whole, just as greater regional trends must be sums of individual regions. Regional trends do not conform so easily to predictable models, even when viewed in the long-term and variations of a less significant magnitude disregarded.

Whitmore et al. (1990: 26) expound the need for studies on a regional level (though their 'regions' are still quite large) in order to better understand the "asynchronous" patterns of population growth in difference regions and the effects of population decline. Their reconstruction of the long-term population dynamics of the alluvial Tigris-Euphrates lowlands indicates several long waves (i.e. 4100 BCE to 450 BCE). The small cycles of growth and decline within this wave are considered but are deemed rather negligible to the long-term growth and development of the region. Notably the pattern they describe in the Tigris-Euphrates example is a resilient one, where population can change back and forth quite substantially but persist (*ibid.* 27-29). I would argue that on this level, southwest Iran also shows a resilient pattern, but one that includes a much more varied landscape (i.e. highlands), not just one reliant on irrigation agriculture.

Further down the scale, perhaps we can try and understand how the population trends observed in the medium to long-term for southwest Iran fit into this puzzle. What I would term regional and interregional population trends as they have been defined throughout this paper may be better labelled 'local' in the context of the preceding discussion. Variability within the greater region is still quite marked and if one was to pursue a more fine-grained approach through the estimation of populations at dwelling, site and up to a regional level, it would be even more so. Especially when dealing with early agriculture, urbanization and processes of sedentarization and nomadization, I think that it is prudent to look at the broad trends occurring at the local level. While in the end the population of both the highlands and lowlands of southwest Iran, as indicated by aggregate occupied area during the four millennia long study period, does increase, it is marked by distinct periods of synchronous and asynchronous growth and decline. Notable changes in the settlement pattern and increases in complexities of interactions between regions, coupled with environmental changes do occur. Such events on the higher planes may not have serious implications for models of long-term populations, but will have an impact on the shape of aggregate site area curves at the local level (regional and interregional, as I have defined it).

Lastly, finding congruence between population models and what is occurring in the archaeological record is near impossible. While births and death rates can be assumed over the long-term we cannot account for unpredictable events. Population trends at a regional level allow us to take into account human agency and understand that the decisions of people and groups affect the trends we observe. Migrations and changes in subsistence strategies are the cumulative results of environmental, social, political, and various other factors, but ultimately the decision of the people involved. Equally, different subsistence strategies also affect the visibility of human populations in the archaeological record and prevent us from seeing a holistic picture of what the entirety of the population is doing over the long-term. However, I would suggest that if we could construct population trends that included both the sedentary and mobile populations perhaps some of this variability would be less apparent.

Chapter 7 – Summary, Conclusions and Future Research

7.1 Networks of Interaction – Dispersal, agglomeration, sedentarization and nomadization

In the preceding chapter I have outlined several key transformations that took place over the *longue durée* in southwest Iran:

- Regional growth - Dispersed agricultural villages in the sixth millennium develop and grow to reach a peak in the mid fifth millennium, at the same time we see a trend toward settlement agglomeration in both highlands and lowlands. Growing similarities between pottery styles in the majority of the study regions indicate that there is more interaction between the highlands and lowlands in the latter fifth millennium onwards indicating an increase in movement between regions with transhumance as the mechanism.
- Mesopotamian growth – There is increased Mesopotamian influence on settlement and population trends in the greater region, and this growth is at the expense of southwest Iranian populations; increased instability in the system, perhaps associated with increase socio-economic complexity causing fluctuations in the population trends between regions.
- Lowland growth and population explosion - By the third millennium, if not earlier, we see highland and lowland population trends truly diverging, and perhaps suggesting complete cycles of nomadism and sedentarization; in the early third millennium the growth of lowland populations outdistances those of the highlands and following this, unprecedented population growth coupled with settlement nucleation occurs in both the highlands and lowlands in the latter third millennium.

Throughout the majority of the sixth millennium all regions experience a slight growth from minimal populations and then appear to plateau. These small agricultural settlements are few and very small in size with many less than one hectare, and in most cases no more than two hectares, though there are a few sites in each region that are beginning to grow slightly larger (i.e. Tepe Musiyan on the Deh Luran Plain) (Alizadeh 2003: fig. 9; Wright and Carter 2003; Neely and Wright 1994:

table V.2-V.4; Sumner 1990a: fig 1). Towards the end of the sixth millennium and the beginning of the fifth there is growth in the aggregate occupied area of all the study regions. In the two largest study areas, the Kur River Basin and the Susiana plain there is quite substantial growth, while the trend is less marked but no less important on the three more peripheral plains. By the middle of the millennium, when the aggregate occupied area is at its highest, there appears to be a trend toward settlement aggregation; that is, people appear to be moving away from small settlements and into larger ones. Throughout this time there appears to be increased links and possible migrations between Mesopotamia and various regions in southwest Iran in several cycles (Abdi 2002, 2003; Alizadeh 1992). Overall, growth is occurring in every region stimulated by a probable increase in the number of births over deaths. As an example the population of the Ram Hormuz plain based on aggregate occupied area and total number of sites does not reach this level again until the early second millennium.

Coterminous with regional population growth in the mid to late fifth millennium, there is an increase in interaction between the highland and lowland regions evidenced by wide-ranging ceramic traditions (see Alizadeh 1992; 2006:18; Voigt and Dyson 1992; Abdi 2002). At the same time there is evidence for the emergence of campsites on the Islamabad plain (Abdi 2002, 2003), increased unity in cultural tradition throughout the central Zagros (Henrickson & Vidali 1987), and a highland polity centred on Tal-i Bakun in Fars controlled by mobile pastoralist groups (Alizadeh 2006). The way a landscape can be utilized is integral to understanding networks of interaction. Much of the agriculturally productive land is also pastorally productive land and therefore interaction between groups practicing different modes of subsistence is inevitable. The landscape, through such features as the Zagros defiles also provide the medium through which movement and networks of interaction are maintained between otherwise geographically isolated landscapes. The organization of this movement is not a simple task and ethnographic sources indicate the intricacies involved in the planning of coordinated movements of tribes through this landscape so as to eliminate conflict (Beck 1986: 172; Barth 1964: 5). Increased movements and interaction between regions is facilitated by the development of transhumance and perhaps indicates and increase in socio-political complexity not only in areas of large sedentary populations but also of a different kind in peripheral and highland regions. Along with increasing populations, and early state formations, the demand for wool in the lowland centres has been cited as an impetus for mobile pastoralism (Alizadeh 2006: 23).

By the beginning of the fourth millennium, at least in the lowlands, we see the crystallization of the agglomeration trend. Equally, by the Banesh phase (c. mid fourth millennium) in the Kur River Basin we again see settlement agglomeration and urbanization. Recently, Ur et al. (2007) have demonstrated that a shift from dispersed settlement around the central mound to clustering and settlement agglomeration occurred at Tel Brak in Northern Syria in the LC2 (c. 4200-3900 BCE), and the settlement further increased in size and density in the succeeding phase. The smaller surrounding settlements seem to have imploded toward the central tell and they suggest that this required a less centralized authority than is usually cited to account for early urbanization (*ibid*). While this example is for a single site and its environs, it demonstrates a concept that may well be visible at the regional as well as site level. Such transformations have implications for urbanization that require an understanding of different regional trajectories of development. Processes of centralization and socio-political formations that may have contributed to urbanism and complexity in the lowlands may not be relevant for the geography and economic subsistence of the highlands.

With the Uruk phenomenon we see evidence of possible movements of sedentary populations throughout the greater region and Mesopotamia (Pollock 2001; Adams 1981; Henrickson 1994). In the Kur River Basin sequence, the Banesh phase data emphasises the pull of a growing urban polity to high sedentary populations and possibly mobile ones as well. Throughout the fourth and into the third millennium, when trying to define robust long-term trends it is easy to get lost in the noise of the data and dwell on the timing of events, types of socio-political organization and early state formations that could alone be the focus of a dissertation such as this. The trends of the fourth millennium in general, emphasize the instability of the system and the variation that is occurring due to inconsistencies in the number of births, deaths, migrations or changes in subsistence strategies. Indeed, Adams (1981: 70) notes "The range and rate of movement of prehistoric peoples, under conditions of low population density and hence limited competition for the use of land, may often have been much greater than seems "natural" on a priori grounds". Movement throughout the greater region was perhaps a very feasible response to social, political, economic and environmental changes occurring at this time.

Fluctuations in the trends of each individual region often do not appear synchronous during the course of the fourth millennium. It is possible that increases in one region were the result of losses in another, or loss of sedentary population in one region gave rise to increases in mobile pastoralism in peripheral regions. However, such correlations are simplistic and do not take into account the many factors that must have had an effect. For example, looking at the settlement in the peripheries of the Susiana plain during state formation, Wright (1987: 149) proposed and disproved that they may have been used as areas of refuge during times when the more centralized systems were in crisis, and that the populations utilizing them would have shifted further towards the mobile end of the subsistence continuum. On the contrary, mobile pastoralism increased when sedentary population increased and most importantly, the increases in these two subsistence strategies seem to occur after periods of decline, not during them.

Increased fluctuations in the population trends beginning in the fourth millennium may also represent increased socio-political complexity, and differing trajectories associated with diverging modes of subsistence. Whitmore et al. (1990: 36) argue on a greater regional scale and over the *longue durée* that increased socio-political complexity appears to be linked to greater fluctuations in population levels. Whether or not this observation can be translated to a more micro level analysis is questionable but remains an interesting suggestion.

From the mid fourth through early third millennium, one can clearly see different trajectories for settlement in the highlands and lowlands as exemplified by the Kur River Basin on one hand and the Susiana and Deh Luran plains on the other. Interestingly, the trend toward settlement agglomeration is maintained even when there is a massive decrease in population in the Late Uruk and Early Susa III period in the Susiana plain. By the mid-third millennium, there are truly dynamic events occurring in opposition to each other between the highlands and lowlands. The mid-third millennium population decline in the Kur River Basin is in sharp contrast to the incredible growth that is beginning to occur in sedentary settlement in the Susiana Plain. The succeeding resettlement of the Kur River Basin is again quite dynamic. By the end of the third millennium never before seen increases in sedentary population and the size of sites occurs in the Susiana plain, Deh Luran Plain and Kur River Basin.

7.2 Planes of analysis and future research

In this dissertation, survey data has been analysed in order to define population trends in southwest Iran over four millennia from 6000 to 2000 BCE. With this long-term perspective it is hoped that the relationship between population trends occurring in the highlands and the lowlands has been further elucidated in light of broad concepts such as settlement dispersal, agglomeration, nomadization and sedentarization. Several levels of analysis have been employed. At the micro level, I have dealt with the disparities in chronologies between regions, problems with making comparisons of standardized data and issues of data manipulation. At an intermediate level, population and settlement trends have been discussed in terms of overarching concepts such as settlement nucleation and dispersal and modes of subsistence. Finally, at the broadest level, the long-term population trends of these regions have been discussed in terms of how they contribute to creating a picture of the greater region, how this picture can be viewed in terms of other macro-regions (i.e. Mesopotamia), and how these trends compare to model population dynamics. The relevance to long-term development of peaks, troughs, and spatially asynchronous trends are all dependent on the scale on which the data is presented. Therefore, I think that a lot can be gleaned about important developments and events by having a fuller understanding of the context in which socio-economic, political and social changes occurred. The movements of people, birth and death rates, and changes in subsistence are ultimately reflected in population trends occurring at a local and regional level. Assessing the impact of these trends on an interregional level over the long-term helps us to identify really robust trends that require further research and development to contextualize.

In order to do this, perhaps several ground-up approaches can be taken and the improvement in the nature and comparability of the raw data will perhaps reflect an improvement in interpretation. Better defined ceramic chronologies and new radiocarbon dates for southwest Iran are required to eliminate some of the problems involved in building up a picture of comparable interregional population trends. Survey with a focus on locating all types of sites within a region will help to build up a cohesive understanding of land use and settlement by the urban, rural and mobile populations inhabiting it.

As more focus is being put on understanding the more ephemeral mobile populations in the archaeological record, perhaps a more holistic focus will emerge in which the totality of land use within a region can be explored. Further, proxy techniques can perhaps be employed with to account for the lack of evidence regarding mobile populations. The relationship between model population dynamics and the reality of what we are seeing in an analysis like this, as well as a better understanding of how regional dynamics fit into the greater region and beyond also require further explorations.

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Appendix A

Settlement Data

	Susiana b			Susiana c			Susiana d			Susa A			Early Uruk
	5700	5400	5100	5100	4900	4700	4700	4450	4200	4200	4050	3900	3900
Aggregate occupied area (ha)	21	32	43	57	78	94	80	81	86	86	80	63	58
Total number of sites	17	28	39	39	28	76	76	28	78	78	28	37	37

Table A1 - Settlement data for the Village period on the Susiana Plain- data from Kouchoukos 1998; table 3.8

	Susiana b		Susiana c		Susiana d		Susa A		Early Uruk
Year	5700	5400	5100	4900	4700	4450	4200	4050	3900
Aggregate occupied area (ha)	21	32	50	78	87	81	86	80	60.5
Total number of sites	17	28	39	28	76	28	78	28	37

Table A2 - Averaged settlement data for the Village period on the Susiana Plain – data from Kouchoukos 1998; table 3.8

Susiana Plain – Uruk Period							
			Aggregate occupied area (ha) by period				
Site Name	**Site No.**	**Total Area (ha)**	**TSA**	**Early Uruk**	**Middle Uruk**	**Late Uruk**	**Comment**
Susa		100.00	5.00	12.00	25.00	9.00	
Chogha Mish					10.00	18.00	
Ishan Abu Diyyayyat	004	6.88		2.76	1.12		
	005	2.40			0.80		
	006	4.84	1.84	1.84			
Tepe Senjar	007	-13.00			1.00		
Tepe Saiyeh	008	1.08		0.42	0.76		
Tepe Band-i-bal	013	1.70			?		Special Function
	015	2.00			0.02		Special Function
Tepe Mohammed Ahga	016	0.68	0.68	0.68	0.68		
Tepe Jaffarabad	020	0.20			?		Special Function
	022	1.51	0.50	1.51	1.51		
Tepe Suleiman	024	0.84		0.40	0.40		
Tepe Jardari	027	0.60		0.60	0.60		
	032	1.50		1.50	1.50	1.50	
Ishan Rud	033	1.24		1.24			
	034	1.88		1.88	1.88	0.92	
	035	1.04		1.04	1.04		
Tepe Sharafabad	036	1.30		1.04	1.04	0.31	
Tepe Galeh Bongoon	037	3.50			0.80		
Tepe Rahimeh	039	1.96		0.68	1.50	1.38	
	040	0.92			0.56		Special Function

	044N	0.80			0.80		
	044S	1.28		1.28	1.28		
	045	0.60			0.08		Special Function
			Aggregate occupied area (ha) by period				
Site Name	**Site No.**	**Total Area (ha)**	**TSA**	**Early Uruk**	**Middle Uruk**	**Late Uruk**	**Comment**
Bugga Ishan	049	4.28		3.48	1.00		
Tepe Alvan	050	1.20		0.75	0.75		
	052	1.52	0.96	1.36	0.96		
	054	2.48		2.48	2.48	2.48	
Abu Fanduweh	059	9.94	5.16	6.92	9.56	8.16	
	061	1.28	0.60	1.28	1.28	0.68	
	064	1.72	1.48	1.72	0.64		
	067	2.00	2.00				
	076	2.62		2.62	2.62		
Tepe Sayed Nabih	079	3.20		3.20	2.32	1.84	
	089	1.64			?		
Kasanet Sabeh	090	3.88		2.28	2.28		
	093	2.52		1.12	1.12		
	094	2.40	2.40	2.40	2.40		
Tepe Keihf	096	10.76		0.50	5.20	4.00	
Haft Tepe	098	0.80			0.80		
	099	2.76	2.00	2.00	2.00		
Chogha Pahn	101	1.20		1.20			
	102	1.20			1.20		
Chogha Kabira	108	2.80	1.00	1.56	2.80	0.56	
Tepe Twaim	112	3.00	1.50	1.50			
Tepe Sanjar	113	5.16		1.28	3.58	1.12	
Tepe Deh Now	120	9.00		6.00	6.00		

	121	1.33		1.33	1.33		
	153	6.44		6.44	6.44		
Chogha Pahwandeh	165	2.00		1.01	2.00		
			Aggregate occupied area (ha) by period				
Site Name	**Site No.**	**Total Area (ha)**	**TSA**	**Early Uruk**	**Middle Uruk**	**Late Uruk**	**Comment**
	171	2.80		2.80	2.80	2.80	
	173	2.08		2.08	2.08		
	182	1.36	1.36				
	190	0.56	0.56				
Burj-i-Bazazi	197	1.00		1.00	1.00		
	218	2.00			1.50		
Tepe Sadarabad	220	1.75			1.12		
Tepe Imam Atuyi	240	2.20		2.20	2.20		
	266	1.44	1.44	1.44	1.44		
	269	0.40	0.40	0.40			
	284	0.84	0.84	0.84	0.84		
	285	0.36		0.36	0.36		
	286	1.12		1.12	1.12		
	288	0.50		0.50	0.50		
	289	0.38		0.38	0.38		
	290	2.75		2.00	2.00		
Aggregate occupied hectares			**29.72**	**96.42**	**128.47**	**52.75**	
Total number of sites			**18**	**49**	**56**	**14**	

Table A3 - Settlement Data for the Uruk period on the Susiana Plain from Johnson 1973

Site name/no.	Early Susa III	Middle Susa III	Late Susa III
Susa	11.00	11.00	11.00
308	2.20	2.20	
396	3.20	3.20	3.20
5	0.20		
39	0.20		
49	0.50		
Aggregate occupied hectares	**17.30**	**16.40**	**14.20**
Total number of sites	**6**	**3**	**2**

Table A4 - Settlement Data for the Susa III period on the Susiana Plain – data from Alden 1987: Table 28

Deh Luran Plain														
Site	**No.**	**Total Area (ha)**	**Aggregate Occupied Area (ha) by Period**											
			CMT	**Sabz**	**Khazineh**	**Mehmeh**	**Bayat**	**Farukh**	**Suse**	**E Uruk**	**M Uruk**	**L Uruk**	**Jemdet Nasr**	**Early Dynastic**
Tepe Gendarmary	7	0.24								0.24				
Tepe Garmasi	11	2.35			0.28			1.54		1.54				
Unnamed	14	1.42												
Mound		0.27												
Entire Site		1.15			1.15									
Unnamed	15	0.67			0.25	0.67		0.67						
Sohz (Sabz East)	18	3.10												3.10
Tepe Chakali	19	2.59									2.59			
NW Mound		0.26			0.26									
SE Mound		2.31								2.31				
Tepe Musiyan	20	17.31			2.00	4.00	4.00	9.00	5.00					15.00
Ali Kosh	21	1.43	0.40		0.15	0.15								
Tepe Sefid	22	0.15			0.15	0.10								
Chagha Sefid	23	1.98	0.42	0.33	0.31	0.31	0.26	0.12		0.31	0.17	0.09		
Baulah	24	4.18											2.09	4.18
Unnamed	25	0.05	0.05	0.05	0.05	0.05								
Unnamed	26	0.05			0.05	0.05								
Tenel Ramon	27	2.49			0.50	0.50	1.00	1.00		1.00				2.00
West														

Site	No.	Total Area (ha)	Aggregate Occupied Area (ha) by Period											
			CMT	Sabz	Khazineh	Mehmeh	Bayat	Farukh	Suse	E Uruk	M Uruk	L Uruk	Jemdet Nasr	Early Dynastic I/II
East														
Tepe Khazineh	28	0.52			0.52	0.52								
Tepe Ashrafabad	29	1.27			0.54	1.27	1.29	0.40						
Tepe Sabz	31	1.51		0.50	1.00	1.51	1.51							
Tepe Farukhabad	32	2.40			1.50	1.50	2.00	2.50		1.00	2.50	2.50	3.00	3.00
Central Mound		0.96 (formerly 3.0)												
Unnamed	33	1.75			0.78									
Tepe Garan	34	3.60												1.50
Unnamed	41	20.00												
Unnamed	43	0.26				0.26	0.26			0.26				
Tepe Soza	54	3.22												1.00
Unnamed	61	0.68								0.68	0.68	0.68		
Unnamed	62	0.42										0.42		0.42
Aliabad	71	0.50			0.30	0.30				0.50	0.50			
Unnamed	84	0.26	0.26		0.26									
Tepe Muradabad	85	1.44			1.44	1.34			1.44					
Unnamed	89	0.10												
Unnamed	90	0.07												
Unnamed	91	0.14					0.14							

Site	No.	Total Area (ha)	Aggregate Occupied Area (ha) by Period											
			CMT	**Sabz**	**Khazineh**	**Mehmeh**	**Bayat**	**Farukh**	**Suse**	**E Uruk**	**M Uruk**	**L Uruk**	**Jemdet Nasr**	**Early Dynastic I/II**
Unnamed	104	3.36									0.95	0.63		2.00
Sagarab	169	0.66								0.66				
Unnamed	222	0.50			0.50	0.50								
Unnamed	240	0.05					0.05							
Unnamed	241	0.11			0.11	0.11								
Unnamed	247	0.67						0.67	0.67					
Unnamed	248	1.99					0.87							
Unnamed	262	3.36						0.20						
Unnamed	286		1.00	1.00	1.00			0.40						
mound		2.28												
platform		2.04												
Unnamed	290	0.44					0.44							
Unnamed	292	8.40								8.40				
Tepe Jelise	312	3.80									2.00			
Aggregate occupied hectares			**2.13**	**1.88**	**13.10**	**13.14**	**11.82**	**16.50**	**7.11**	**16.9**	**9.39**	**4.32**	**5.09**	**27.20**
Total number of sites			**5**	**4**	**22**	**17**	**11**	**10**	**3**	**11**	**7**	**5**	**2**	**9**

Table A5 - Settlement Data for the Deh Luran Plain – Data from Neely and Wright 1994

Table A5 - Settlement Data for the Deh Luran Plain – Data from Neely and Wright 1994

Ram Hormuz Plain													
	Aggregate Occupied Area (ha) by Period												
Site	**Early Susiana**	**Middle Susiana**			**Late Susiana**		**Uruk**			**Banesh**	**Hiatus**	**Middle Elamite**	
		I	**II**	**III**	**Earlier**	**Later**	**Early**	**Middle**	**Late**			**Early 2nd millennium**	**Late 2nd millennium**
RH1: Tal-i Ghazir					1.2	1.2	1.2	1.2	1.2	1.2		1.2	6
RH2: Name Unknown			0.4										
RH3: Tol es Suwada		0.3											
RH4: Tepe Qowaileh													
RH5: Tepe Ghazu					0.5								
RH6: Tepe Moravache					1			1.8	1.8			1.8	1.8
RH7 South: Tol-i Zarini													
RH7 North: Tol-i Zarini													1.4
RH8: Name Unknown													
RH9: Taayer													
RH10: Tepe Mal-i Sandoli		0.4	0.4	0.4	0.4								
RH11: Tepe Bormi					1.5								18
RH12: Name Unknown													
RH13: Name Unknown													
RH14: Imamzadeh Ali Abbas													
RH15: Dar-I chehel													
RH16: Name Unknown													

	Ram Hormuz Plain - Aggregate occupied area (ha) by period												
Site	**Early Susiana**	**Middle Susiana**			**Late Susiana**		**Uruk**			**Banesh**	**Hiatus**	**Middle Elamite**	
		I	**II**	**III**	**Earlier**	**Later**	**Early**	**Middle**	**Late**			**Early 2nd millennium**	**Late 2nd millennium**
RH17: imamzadeh Khauri Na'amat													
RH18: Tepe Sartoli (Boneh Sartoli)					2.5	2.5							
RH19: Name Unknown					1.4								
RH20: Name Unknown													
RH21: Name Unknown													
RH22 North: Name Unknown					0.6								
RH22 South: Name Unknown													
RH23: Name Unknown		0.1	0.1	0.1									
RH24: Name Unknown		0.9	0.9	0.9	0.9								
RH25: Name Unknown													
RH26: Bisetin													
RH27: Name Unknown													
RH28: Name Unknown													
RH29: Name Unknown													
RH30: Name Unknown													
RH31: Tol-i Zahari													1.1
RH32: Tepe Bayamun					0.9		0.6	0.6					
RH33: Name Unknown													

RH34: Sar Cheshmeh													
	Ram Hormuz Plain - Aggregate occupied area (ha) by period												
Site	**Early Susiana**	**Middle Susiana**			**Late Susiana**		**Uruk**			**Banesh**	**Hiatus**	**Middle Elamite**	
		I	**II**	**III**	**Earlier**	**Later**	**Early**	**Middle**	**Late**			**Early 2nd millennium**	**Late 2nd millennium**
RH35: Dar-i Dun													0.1
RH36: Ram Hormuz Cemetary													
RH37: Name Unknown													
RH38: Name Unknown													
RH39: Tol-i Sorkhi													
RH40: Name Unknown													?1.2?
RH41: Ram Hormuz Ab Anbar													
RH42: Name Unknown													
Aggregate Occupied Area	**0**	**1.7**	**1.8**	**1.4**	**10.9**	**3.7**	**1.8**	**3.6**	**3**	**1.2**	**0**	**3**	**23.6**
Total Number of Sites	**0**	**4**	**4**	**3**	**10**	**2**	**2**	**3**	**2**	**0**	**0**	**2**	**7**

Table A6 - Settlement Data for the Ram Hormuz Plain- data from Wright and Carter 2003: 76-82

	Mushki	Jari	Shamsabad	Bakun	Lapui	Banesh	Hiatus?	Kaftari
Aggregate occupied hectares	6	41	86	189	105	86	0	278
Total number of sites	8	50	102	156	108	42	0	74

Table A7 - Settlement Data for the Kur River Basin – Data from Sumner 1990: table 1 and Sumner 1994

	Early Bakun	Middle Bakun	Late Bakun	Lapui
Aggregate occupied hectares	65	99	61	105
Total number of sites	73	85	65	108

Table A8 - Settlement data for the Early –late Bakun and lapui phases – Data from Sumner 1994

	Early Banesh	Middle Banesh	Late Banesh
Aggregate occupied hectares	43.8	73.8	67
Total number of sites	28	26	20

Table A9 - Settlement data for the Banesh phase in the Kur River Basin – data from Sumner 2003: table E2

Northwest of the Marvdasht									
		Sites occupied in each period							
Site	**No.**	**Mushki**	**Jari**	**Early Bakun (B1)**	**Bakun B2 and Gap**	**Bakun A**	**Lapui**	**Banesh**	**Kaftari**
Tall-e-Charkhu	DK 101					x	x		
Jahnyian	DK 102								
Bizjan Cave	Dk 103								
Qadamgah	DK 104		?				x		
Tall-e Balangoon	DK 105		?	x	x	x	x		
Tall-e Ashki	DK 106					x	x		
Rock Shelter	DK 107								
Tall-e Bakan	DK 108						x		x
Tall-e Manjquli	DK 109 A								
	DK 109 B								
Tall-e Char	DK 110								
Tall-e Jalali	DK 111						x		x
Tappeh Emamzadeh Shah Gheib	DK 112								
Tall-e Rashti	DK 113						x	x	x
Tall-e Sooz/Sabz A	DK 114						x		x
Tall-e Sooz/Sabz B	DK 115								x
Rashmijan	DK 116			x	?				
Tall-e Halqeh A	DK 117								
Tall-e Halqeh B	DK 118								
Qadamgah A	DK 119 A								
Qadamgah B	DK 119 B								
Tall-e Morad	DK 120								
Qabrestan- e Qadamgah	DK 121								x

		Sites occupied in each period							
Site	**No.**	**Mushki**	**Jari**	**Early Bakun (B1)**	**Bakun B2 and Gap**	**Bakun A**	**Lapui**	**Banesh**	**Kaftari**
Tall -e Gashk	DK 122								
Tall-e Mamalis (Gap)	DK 123			x	x	x	x		x
Tall-e Seyedi A	DK 124								
Tall-e Seyedi B	DK 125								
Tall-e Gashki	DK 126					x	x		
Tall-e Tajabad	DK 127						x		
Tall-e Dam Qale/Tall-e Bozorg	DK 128								
Tall-e Qaleh	DK 129						x		x
Qabrestan-e Sivand	DK 130								
Tall-e Qasr-e Dasht	DK 131						x		x
Tall-e Rahmatabad	DK 132						x		x
Tall-e Qaleh Kuhneh	DK 133								
Char-taq-e Mushkan	DK 134								
Tappeh Deh Beral	DK 135								
Tall-e Ab-e Barik A	DK 136								
Tall-e Ab-e Barik B	DK 137								
Aq Qaleh	DK 138						x	x	x
Tall-e Koshkak	DK 139								
Tall-e Gap Nazarabad	DK 140			x	x				
Tall-e Nazarabad (Qaleh Kuhneh)	DK 141								
Tall-e Mazari (Bagyian)	DK 142			x	x				
Tall-e Mashhadi Beilu	DK 143								
Tall-e Qale Chogha	DK 144								
Tall-e Shangooli (Lapui)	DK 145						x		

		Sites occupied in each period							
Site	**No.**	**Mushki**	**Jari**	**Early Bakun (B1)**	**Bakun B2 and Gap**	**Bakun A**	**Lapui**	**Banesh**	**Kaftari**
Tall-e Zari	DK 146		x	x					
Tall-e Gamli	DK 147					x	x		
Tall-e Asfyian	DK 148								
Tall-e Kharestan Sofla	DK 149					x	x		
Tall-e Deh-e Sukhteh	DK 150								
Tall-e Kooreh	DK 151								
Tall-e Aspas	DK 152			x	x				
Tall-e Babaii	DK 153								
Qaleh Shahr Ashub	DK 154						x		?
Kooshk-e Zar A	DK 155								
Kooshk-e Zar B	DK 156			x	x		x		
Tall-e Shahroyan	DK 157								
Qasr-e Golandam	DK 158								
Tall-e Hajiabad	DK 159								
Tall-e Bizjan	DK 160								
Tall-e Shool	DK 161								
Tall-e Sarooii	DK 162								
Tall-e Kamin	DK 163					x	x		x
Tall-e Ezzabad	DK 164								
Tall-e Emamadeh Seyyed Haj Gharib	DK 165								
Tall-e Maqsudabad (Tall-e Hadi A)	DK 166			x	x				x
Tall-e Hadi B	DK 167			x	x	x			
Tall -e Darvazeh	DK 168					x			
Tall-e Jafarabad	DK 169								
Tall-e Emamzadeh Bibi Sultan	DK 170						x		

		Sites occupied in each period							
Site	**No.**	**Mushki**	**Jari**	**Early Bakun (B1)**	**Bakun B2 and Gap**	**Bakun A**	**Lapui**	**Banesh**	**Kaftari**
Tall-e Sooz A (Dolatabad A)	DK 171								?
Tall-e Sooz B (Dolatabad B)	DK 172						x		x
Tall-e Malekabad	DK 173								
name unknown	DK 174								
Tall-e Qabrestan Kooshk	DK 175								
Tall-e Gap-e Kenareh	DK 176								
Tall-e Kenareh	DK 177								
Total Number of Occupied Sites			1	10	8	10	23	2	14

Table A10 - total number sites per period from survey to the NW of the Marv Dasht by Alizadeh in 1995 – Data from Alizadeh 2003

	Mushki	Jari	Early Fars	Middle Fars I/II	Late Fars/Bakun A	Lapui	Banesh	Kaftari
Total number of sites		1	4	7	10	22	2	15

Table A11 - Total number of sites from each period from Alizadeh's 1995 survey of the area to the NW of the Marv Dasht (Alizadeh 2006). These totals are an update of the totals from the 2003 publication. The updated data was used in the graphs in chapter 5.

	Total number of sites by period			
	Middle Fars 1	**Middle Fars 2**	**Late Fars**	**Proto-Banesh (Lapui)**
Marv Dasht (Alizadeh 2006)	3	14	10	*No data
NW of Marv Dasht (Alizadeh 2003)	7	7	10	22

Table A12 – Comparison of Periodizations of the fifth millennium in the Marv Dasht, KRB. Alizadeh's 2003 survey was done to the NW of the Marvdasht, but included some sites surveyed previously by Sumner (1972). Alizadeh's 2006 publication included a restudy of 32 sites that were previously surveyed by Sumner (1972)

Islamabad Plain				
Period	**Sedentary sites (Aggregate occupied hectares)**	**Campsites (Aggregate occupied hectares)**	**Total number of sedentary sites**	**Total number of campsites**
L Neolithic	23		18	
E Chalcolithic	43.25		28	
E M Chalcolithic	57.5	5	26	11
M M Chalcolithic	58.75	7.5	24	12
L M Chalcolithic	52.25	5	17	10
E L Chalcolithic	23		14	
L L Chalcolithic	3.25		14	

Table A13 - Settlement Data for the Islamabad Plain- data from Abdi 2003